Native Trees and Shrubs of great Britain

A Wikipedia Compilation
by
Michael A. Linton

Contents

1 Alder **1**

1.1 Etymology . . . 1
1.2 Description . . . 1
1.3 Ecology . . . 1
1.3.1 Nitrogen fixation . . . 1
1.3.2 Parasites . . . 2
1.4 Uses . . . 2
1.5 Classification . . . 3
1.6 References . . . 7
1.7 Further reading . . . 7
1.8 External links . . . 7

2 Apple **8**

2.1 Botanical information . . . 8
2.1.1 Wild ancestors . . . 9
2.1.2 Genome . . . 10
2.2 History . . . 10
2.3 Cultural aspects . . . 11
2.3.1 Germanic paganism . . . 11
2.3.2 Greek mythology . . . 11
2.3.3 The forbidden fruit in the Garden of Eden . . . 13
2.4 Cultivars . . . 13
2.5 Cultivation . . . 14
2.5.1 Breeding . . . 14
2.5.2 Pollination . . . 15
2.5.3 Maturation and harvest . . . 15
2.5.4 Storage . . . 16
2.5.5 Pests and diseases . . . 16
2.6 Production . . . 16
2.7 Nutrition . . . 17
2.7.1 Phytochemicals . . . 17
2.8 Human consumption . . . 17
2.8.1 Popular uses . . . 17

2.8.2 Organic production . . . 18
2.8.3 Allergy . . . 18
2.8.4 Toxicity of seeds . . . 18
2.9 Proverbs . . . 18
2.10 See also . . . 18
2.11 References . . . 19
2.12 Further reading . . . 22
2.13 External links . . . 22

3 Alnus glutinosa **31**
3.1 Description . . . 31
3.2 Taxonomy . . . 32
3.3 Distribution and habitat . . . 32
3.4 Ecological relationships . . . 33
3.5 Cultivation and uses . . . 34
3.5.1 Timber . . . 34
3.5.2 Tanning and dyeing . . . 34
3.5.3 Other uses . . . 35
3.6 Health . . . 35
3.7 Details of Alder structure and galls . . . 36
3.8 References . . . 36

4 Malus sylvestris **38**
4.1 Progenitor of cultivated apples . . . 38
4.2 Description . . . 38
4.3 Pests . . . 38
4.4 Gallery . . . 38
4.5 See also . . . 39
4.6 Notes . . . 39
4.7 External links . . . 39

5 Fraxinus **40**
5.1 Selected species . . . 40
5.2 Ecology . . . 44
5.3 Threats . . . 44
5.4 Uses . . . 44
5.5 Mythology and folklore . . . 46
5.6 See also . . . 46
5.7 References . . . 46
5.8 External links . . . 47

6 Fraxinus excelsior **49**
6.1 Description . . . 49

6.2 Ecology . . . 49
6.3 Genome . . . 50
6.4 Ash dieback . . . 52
6.5 Uses . . . 52
6.6 Mythology . . . 53
6.7 Folklore . . . 53
6.8 Cultivars . . . 54
6.9 Gallery . . . 55
6.10 References . . . 55
6.11 External links . . . 55

7 Birch **56**
7.1 Etymology . . . 56
7.2 Description . . . 56
7.2.1 Flower and fruit . . . 57
7.3 Ecology . . . 57
7.4 Species . . . 57
7.5 Uses . . . 59
7.5.1 Medical . . . 60
7.5.2 Paper . . . 60
7.5.3 Tonewood . . . 61
7.6 Culture . . . 61
7.7 See also . . . 61
7.8 References . . . 61
7.9 Sources . . . 62
7.10 External links . . . 62

8 Betula pendula **70**
8.1 Description . . . 70
8.2 Distribution and habitat . . . 71
8.3 Taxonomy . . . 71
8.4 Ecology . . . 71
8.5 Uses . . . 72
8.6 Cultivation . . . 72
8.6.1 Cultivars . . . 72
8.7 See also . . . 72
8.8 References . . . 73

9 Betula pubescens **79**
9.1 Characteristics . . . 79
9.1.1 Species identification . . . 79
9.1.2 Distribution . . . 79

9.2 Cultivars . . . 81
9.3 Uses . . . 81
9.4 References . . . 81

10 Beech **82**
10.1 Habitat . . . 82
10.2 Distribution . . . 83
10.2.1 Britain and Ireland . . . 83
10.2.2 Continental Europe . . . 83
10.2.3 North America . . . 84
10.2.4 Asia . . . 85
10.3 Uses . . . 85
10.3.1 As an ornamental . . . 86
10.4 See also . . . 88
10.5 References . . . 88
10.6 External links . . . 89

11 Fagus sylvatica **90**
11.1 Description . . . 90
11.2 Distribution and habitat . . . 91
11.3 Ecology . . . 93
11.4 Cultivation . . . 94
11.5 Timber . . . 95
11.6 Other uses . . . 95
11.7 Pathogens . . . 97
11.8 See also . . . 98
11.9 Notes . . . 98
11.10 External links . . . 98

12 Buxus **99**
12.1 Selected species . . . 101
12.2 Uses . . . 104
12.2.1 Wood carving . . . 105
12.2.2 Musical instruments . . . 105
12.3 See also . . . 106
12.4 References . . . 106
12.5 External links . . . 106

13 Buxus sempervirens **107**
13.1 Description . . . 107
13.2 Distribution and habitat . . . 107
13.3 Cultivation . . . 107
13.4 Timber . . . 108

13.5 Other uses . . . 108
13.6 See also . . . 108
13.7 References . . . 109

14 Cherry **110**
14.1 Botany . . . 110
14.2 History . . . 110
14.2.1 Etymology and antiquity . . . 110
14.3 Wildlife value . . . 111
14.4 Cultivation . . . 111
14.4.1 Growing season . . . 112
14.5 Cultivars . . . 113
14.6 Ornamental trees . . . 113
14.7 Commercial production . . . 113
14.7.1 Asia . . . 113
14.7.2 Europe . . . 114
14.7.3 North America . . . 115
14.7.4 Australia . . . 116
14.8 Nutritional value . . . 116
14.9 Other information . . . 116
14.10 Species . . . 116
14.11 See also . . . 118
14.12 Notes . . . 118
14.13 External links . . . 120

15 Plum **121**
15.1 Description . . . 121
15.2 Species . . . 121
15.3 Cultivation and uses . . . 123
15.4 History . . . 125
15.5 Etymology and names . . . 126
15.6 Production . . . 126
15.7 See also . . . 127
15.8 References . . . 127
15.9 External links . . . 128

16 Prunus avium **129**
16.1 Nomenclature . . . 129
16.1.1 Mazzard . . . 130
16.2 Description and ecology . . . 130
16.3 Cultivation and uses . . . 131
16.3.1 Fruit . . . 131

16.3.2 Ornamental . . . 131
16.3.3 Timber . . . 131
16.3.4 Other uses . . . 133
16.4 Contribution to other species . . . 133
16.5 Cultural history . . . 134
16.6 References . . . 134

17 Prunus padus **136**
17.1 Characteristics . . . 138
17.2 Ecology . . . 138
17.3 Poison . . . 138
17.4 Uses . . . 138
17.5 See also . . . 138
17.6 References . . . 138
17.7 External links . . . 139

18 Prunus spinosa **140**
18.1 Names . . . 140
18.2 Description . . . 140
18.3 Ecology . . . 141
18.4 Uses . . . 141
18.5 See also . . . 141
18.6 References . . . 141
18.7 External links . . . 142

19 Elm **147**
19.1 Taxonomy . . . 147
19.1.1 Etymology . . . 147
19.2 Description . . . 148
19.3 Pests and diseases . . . 148
19.3.1 Dutch elm disease . . . 148
19.3.2 Elm phloem necrosis . . . 149
19.3.3 Insects . . . 149
19.3.4 Birds . . . 149
19.3.5 Development of trees resistant to Dutch elm disease . . . 149
19.4 Uses of elms in landscaping . . . 151
19.5 Other uses of elms . . . 153
19.5.1 Wood . . . 153
19.5.2 Viticulture . . . 154
19.5.3 Medicinal products . . . 154
19.5.4 Fodder . . . 154
19.5.5 Biomass . . . 154

19.5.6 Food . . . 155
19.5.7 Alternative medicine . . . 156
19.5.8 Bonsai . . . 156
19.6 Genetic resource conservation . . . 156
19.7 Notable elm trees . . . 156
19.8 The elm in art . . . 157
19.9 The elm in mythology and literature . . . 158
19.10 The elm in politics . . . 160
19.11 The propagation of elms . . . 161
19.12 Organisms associated with elm . . . 162
19.13 See also . . . 162
19.14 References . . . 163
19.15 Monographs . . . 165
19.16 Further reading . . . 166
19.17 External links . . . 166

20 Ulmus glabra **168**
20.1 Etymology . . . 168
20.2 Classification . . . 168
20.2.1 Subspecies . . . 168
20.3 Description . . . 168
20.4 Pests and diseases . . . 169
20.5 Cultivation . . . 169
20.6 Notable trees . . . 169
20.7 Cultivars . . . 171
20.8 Hybrids and hybrid cultivars . . . 171
20.9 Accessions . . . 172
20.10 Nurseries . . . 172
20.11 Further reading . . . 172
20.12 References . . . 173
20.13 External links . . . 173

21 Ulmus minor subsp. minor **174**
21.1 Description . . . 174
21.2 Pests and diseases . . . 174
21.3 Cultivation . . . 174
21.4 Notable trees . . . 176
21.5 Cultivars . . . 176
21.6 Hybrids . . . 176
21.7 Accessions . . . 176
21.7.1 North America . . . 176
21.7.2 Europe . . . 176

21.8 Nurseries . . . 177
21.8.1 North America . . . 177
21.8.2 Europe . . . 177
21.8.3 Australasia . . . 177
21.9 References . . . 177

22 Crataegus **179**
22.1 Description . . . 179
22.2 Ecology . . . 181
22.3 Uses . . . 181
22.3.1 Culinary use . . . 181
22.3.2 Traditional medicine and research . . . 181
22.3.3 Landscaping . . . 183
22.3.4 Grafting . . . 183
22.3.5 Bonsai . . . 183
22.3.6 Other uses . . . 183
22.4 Folklore . . . 183
22.5 Propagation . . . 185
22.6 Taxonomy . . . 185
22.7 Selected species . . . 185
22.7.1 Selected hybrids . . . 188
22.8 References . . . 188
22.9 External links . . . 190

23 Crataegus monogyna **191**
23.1 Description . . . 191
23.2 Uses . . . 191
23.2.1 Medicinal use . . . 191
23.2.2 In gardening and agriculture . . . 193
23.2.3 Edible "berries", petals, and leaves . . . 193
23.3 Notable trees . . . 193
23.4 Gallery . . . 193
23.5 See also . . . 193
23.6 Notes . . . 194
23.7 References . . . 194
23.8 Further reading . . . 194
23.9 External links . . . 194

24 Crataegus laevigata **195**
24.1 Taxonomy . . . 196
24.2 Cultivars . . . 196
24.3 See also . . . 196

24.4 References . . . 196
24.5 Further Reading . . . 197
24.6 External links . . . 197

25 Crataegus × media **198**
25.1 References and external links . . . 198

26 Hazel **199**
26.1 Species . . . 199
26.2 Uses . . . 200
26.2.1 Mythology and folklore . . . 200
26.3 Gallery . . . 200
26.4 References . . . 200
26.5 External links . . . 201

27 Corylus avellana **202**
27.1 Description . . . 202
27.2 Taxonomy . . . 202
27.3 Ecology . . . 203
27.4 Cultivation and uses . . . 203
27.5 Hazelnuts . . . 203
27.6 References . . . 203
27.7 External links . . . 204

28 Hornbeam **207**
28.1 Origin of names . . . 207
28.2 Identification . . . 207
28.3 Associated insects . . . 207
28.4 Applications . . . 207
28.5 Species . . . 209
28.6 See also . . . 210
28.7 References . . . 210
28.8 External links . . . 210

29 Carpinus betulus **211**
29.1 Description . . . 211
29.2 Cultivation . . . 212
29.3 Gallery . . . 212
29.4 References . . . 212
29.5 External links . . . 213

30 Holly **214**
30.1 Description . . . 214
30.2 Etymology . . . 215

30.3 History . . . 215
30.4 Range . . . 216
30.5 Ecology . . . 216
30.6 Toxicity . . . 217
30.7 Ornamental use . . . 217
30.8 Culture . . . 217
30.9 Selected species . . . 217
30.10 Gallery . . . 226
30.11 References . . . 226
30.12 External links . . . 227

31 Ilex aquifolium **228**
31.1 Description . . . 228
31.2 Distribution . . . 229
31.3 Ecology . . . 230
31.4 Cultivation . . . 230
31.5 Chemistry and toxicity, medicinal and food uses . . . 231
31.6 Other uses . . . 231
31.7 References . . . 232
31.8 External links . . . 233

32 Juniper **234**
32.1 Description . . . 234
32.2 Classification . . . 236
32.3 Cultivation and uses . . . 241
32.4 Allergenic potential . . . 243
32.5 Footnotes . . . 243
32.6 References . . . 243
32.7 External links . . . 243

33 Juniperus communis **244**
33.1 Description . . . 244
33.1.1 Subspecies . . . 245
33.2 Uses . . . 245
33.2.1 Cultivation . . . 245
33.2.2 Crafts . . . 245
33.2.3 Culinary . . . 246
33.2.4 Traditional medicine . . . 247
33.3 Gallery . . . 247
33.4 References . . . 247
33.5 Further reading . . . 248
33.6 External links . . . 248

34 Tilia **249**
34.1 Name . . . 249
34.2 Description . . . 249
34.3 History . . . 251
34.4 Uses . . . 252
34.4.1 Wood . . . 252
34.4.2 Bark . . . 254
34.4.3 Herbalism . . . 254
34.5 Classification . . . 254
34.5.1 Species . . . 254
34.5.2 Hybrids and cultivars . . . 257
34.6 Gallery . . . 257
34.7 See also . . . 258
34.8 References . . . 258
34.9 External links . . . 259

35 Tilia cordata **260**
35.1 Description . . . 260
35.2 Ecology . . . 261
35.3 Pests and diseases . . . 261
35.4 Cultivation and uses . . . 261
35.4.1 Notable trees . . . 261
35.4.2 Hybrids . . . 261
35.4.3 Cultivars . . . 262
35.4.4 Linden flower tea . . . 263
35.4.5 Honey . . . 264
35.4.6 Linden wood . . . 264
35.5 Cultural Significance . . . 264
35.6 References . . . 264

36 Tilia platyphyllos **266**
36.1 Description . . . 266
36.2 Cultivation . . . 266
36.3 Hybrids . . . 267
36.4 Medicinal uses . . . 267
36.5 Famous trees . . . 267
36.6 References . . . 267

37 Maple **268**
37.1 Morphology . . . 268
37.2 Pests and diseases . . . 270
37.3 Cultural significance . . . 271

37.4 Uses . . . 272
37.4.1 Horticulture . . . 272
37.4.2 Tourism . . . 273
37.4.3 Commercial uses . . . 274
37.5 Notes . . . 278
37.5.1 Gallery . . . 279
37.6 See also . . . 279
37.7 References . . . 279
37.7.1 Bibliography . . . 279
37.8 External links . . . 279

38 Acer campestre **280**
38.1 Description . . . 280
38.2 Ecology . . . 280
38.3 Cultivation . . . 281
38.3.1 Cultivars . . . 281
38.4 Bonsai . . . 281
38.5 References . . . 282
38.6 Further reading . . . 282
38.7 External links . . . 282

39 Oak **285**
39.1 Classification . . . 285
39.1.1 Genus *Quercus* . . . 285
39.1.2 Genus *Cyclobalanopsis* . . . 287
39.2 Hybridization . . . 287
39.3 Uses . . . 288
39.4 Biodiversity and ecology . . . 290
39.5 Diseases and pests . . . 292
39.6 Toxicity . . . 293
39.7 Cultural significance . . . 293
39.7.1 National symbol . . . 294
39.7.2 Religious . . . 294
39.7.3 Historical . . . 295
39.7.4 Famous oak trees . . . 295
39.8 Historical note on Linnaean species . . . 297
39.9 See also . . . 297
39.10 References . . . 297
39.11 Bibliography . . . 299
39.12 External links . . . 299

40 Quercus robur **300**

40.1 Taxonomy . . . 300
40.2 Description . . . 301
40.3 Ecological importance . . . 302
40.4 Commercial forestry . . . 302
40.5 Cultivation . . . 302
40.5.1 Cultivars . . . 303
40.5.2 Hybrids . . . 303
40.5.3 Diseases . . . 303
40.6 Symbolism . . . 303
40.6.1 Basque Country . . . 303
40.6.2 Bulgaria . . . 304
40.6.3 Croatia . . . 304
40.6.4 England . . . 304
40.6.5 Germany . . . 304
40.6.6 Ireland . . . 304
40.6.7 Romania . . . 304
40.7 Chemistry . . . 304
40.8 See also . . . 304
40.9 References . . . 305
40.10 External links . . . 306

41 Quercus petraea **312**
41.1 Description . . . 312
41.2 Comparison with pedunculate oak (*Quercus robur*) . . . 314
41.3 Uses . . . 314
41.4 Pontfadog Oak . . . 314
41.5 Diseases and Pests . . . 314
41.6 Notes . . . 314
41.7 References . . . 314
41.8 See also . . . 315

42 Pine **316**
42.1 Etymology . . . 316
42.2 Taxonomy, nomenclature and codification . . . 316
42.3 Distribution . . . 316
42.4 Description . . . 317
42.4.1 Foliage . . . 318
42.4.2 Cones . . . 320
42.5 Ecology . . . 320
42.6 Uses . . . 321
42.6.1 Food . . . 321
42.6.2 Biomedical . . . 321

42.7 See also . . . 321
42.8 Notes . . . 322
42.9 References . . . 322
42.10 Bibliography . . . 322
42.11 External links . . . 322

43 Scots pine **327**
43.1 Botany . . . 327
43.1.1 Taxonomy . . . 329
43.2 Distribution . . . 331
43.2.1 British Isles . . . 331
43.3 Cultivation and uses . . . 332
43.4 Images . . . 332
43.5 Names . . . 332
43.6 References . . . 334
43.7 External links . . . 335

44 Populus **336**
44.1 Description . . . 336
44.2 Ecology . . . 338
44.3 Classification . . . 338
44.3.1 Selected species . . . 338
44.4 Cultivation . . . 341
44.4.1 India . . . 342
44.5 Uses . . . 342
44.5.1 Manufacturing . . . 342
44.5.2 Energy . . . 342
44.5.3 Art and literature . . . 343
44.5.4 Land management . . . 343
44.5.5 Agriculture . . . 343
44.6 See also . . . 343
44.7 References . . . 343

45 Populus tremula **348**
45.1 Description . . . 348
45.2 Ecology . . . 348
45.3 Cultivation . . . 349
45.4 References . . . 349
45.5 Further reading . . . 350
45.6 External links . . . 350

46 Populus nigra **351**
46.1 See also . . . 353

46.2 References . . . 353
46.3 External links . . . 353

47 Rowan **356**
47.1 Names . . . 356
47.2 Botany . . . 357
47.3 Selected species . . . 358
47.4 Uses . . . 361
47.5 Mythology and folklore . . . 361
47.6 See also . . . 362
47.7 References . . . 362
47.8 External links . . . 363

48 Whitebeam **364**
48.1 Appearance . . . 364
48.2 Ecology . . . 364
48.3 Uses . . . 364
48.4 Classification . . . 364
48.5 Selected species . . . 365
48.6 References . . . 367

49 Sorbus aucuparia **368**
49.1 Names . . . 368
49.2 Description . . . 368
49.3 Distribution and habitat . . . 370
49.4 Ecology . . . 371
49.5 Usage . . . 371
49.6 Mythology and customs . . . 373
49.7 Footnotes . . . 374
49.8 References . . . 376
49.9 External links . . . 377

50 Sorbus aria **378**
50.1 References . . . 378

51 Sorbus domestica **379**
51.1 Ecology . . . 379
51.2 Cultivation and uses . . . 379
51.3 Etymology and other names . . . 381
51.4 See also . . . 381
51.5 References . . . 381
51.6 Further reading . . . 381

52 Sorbus torminalis **382**

52.1 Ecology . . . 382
52.2 Uses and etymology . . . 382
52.3 Taxonomy . . . 383
52.4 Gallery . . . 383
52.5 Further reading . . . 383
52.6 References . . . 384
52.7 External links . . . 384

53 Willow **385**
53.1 Description . . . 385
53.1.1 Flowers . . . 385
53.2 Cultivation . . . 386
53.3 Hybrids . . . 386
53.4 Ecological issues . . . 386
53.5 Pests and diseases . . . 387
53.6 Uses . . . 387
53.6.1 Medicine . . . 387
53.6.2 Manufacturing . . . 389
53.6.3 Other . . . 389
53.7 Culture . . . 390
53.8 Selected species . . . 392
53.9 See also . . . 395
53.10 References . . . 396
53.11 Bibliography . . . 397
53.12 External links . . . 397

54 Salix pentandra **398**
54.1 References . . . 399

55 Salix fragilis **400**
55.1 Description . . . 400
55.1.1 Taxonomy . . . 400
55.2 Ecology . . . 400
55.3 Cultivation . . . 401
55.4 Invasive species . . . 402
55.5 References . . . 402
55.6 External links . . . 402

56 Salix alba **403**
56.1 Ecology . . . 403
56.2 Uses . . . 403
56.2.1 Cultivars and hybrids . . . 403
56.2.2 Medicinal uses . . . 404

56.3 References . . . 405
56.4 Further Reading . . . 405
56.5 External links . . . 405

57 Salix triandra **407**
57.1 Description . . . 407
57.2 Taxonomy . . . 407
57.3 Cultivation and uses . . . 407
57.4 References . . . 409
57.5 External links . . . 409

58 Taxaceae **410**
58.1 Classification . . . 410
58.2 References . . . 410
58.3 Footnotes . . . 411

59 Taxus baccata **412**
59.1 Taxonomy and naming . . . 412
59.2 Description . . . 412
59.3 Longevity . . . 413
59.4 Significant trees . . . 413
59.5 Allergenic potential . . . 414
59.6 Toxicity . . . 414
59.7 Uses and traditions . . . 415
59.7.1 Religion . . . 415
59.7.2 Medicines . . . 417
59.7.3 Woodworking and longbows . . . 418
59.7.4 Horticulture . . . 419
59.7.5 Musical instruments . . . 420
59.8 Conservation . . . 420
59.9 See also . . . 420
59.10 Notes . . . 420
59.11 References . . . 422
59.12 External links . . . 422

60 Shrub **423**
60.1 Shrubs as a botanical structural form . . . 424
60.2 List of shrubs (bushes) . . . 425
60.3 See also . . . 425
60.4 References . . . 425

61 Rhamnus frangula **426**
61.1 Taxonomy and naming . . . 426

61.2 Description . . . 426
61.3 Ecology . . . 426
61.3.1 Invasive species . . . 427
61.4 Uses . . . 429
61.4.1 Decorative . . . 429
61.4.2 Medicinal . . . 429
61.4.3 Charcoal . . . 429
61.5 References . . . 430

62 Rhamnus cathartica **431**
62.1 Description . . . 431
62.2 Toxicity . . . 432
62.3 Ecology . . . 432
62.3.1 Allelopathy . . . 432
62.3.2 Invasive species . . . 432
62.4 Uses . . . 433
62.5 Control methods . . . 433
62.6 References . . . 433
62.7 External links . . . 434

63 Sambucus nigra **435**
63.1 Description . . . 435
63.1.1 Subspecies . . . 436
63.2 Cultivation . . . 436
63.3 Culinary uses . . . 437
63.4 Medicinal . . . 438
63.5 Diseases . . . 439
63.6 Wildlife value . . . 440
63.7 Other uses . . . 440
63.8 References . . . 440
63.8.1 Further reading . . . 442
63.9 External links . . . 442

64 Cornus sanguinea **443**
64.1 Description . . . 443
64.2 Ecology . . . 443
64.3 Uses . . . 443
64.4 References . . . 444

65 Sorbus rupicola **445**
65.1 References . . . 446
65.2 Further reading . . . 446
65.3 External links . . . 447

66 Hippophae rhamnoides **449**
66.1 Description and biology . . . 449
66.2 Taxonomy . . . 449
66.3 Range . . . 449
66.4 Cultivation . . . 449
66.5 Use . . . 450
66.5.1 Food . . . 450
66.5.2 Use in the traditional medicine . . . 450
66.5.3 Pharmacological activities . . . 450
66.5.4 Agricultural engineering . . . 450
66.6 Agricultural practices . . . 450
66.6.1 Planting . . . 450
66.6.2 Plant protection . . . 450
66.6.3 Weed control . . . 451
66.7 See also . . . 451
66.8 References . . . 451
66.9 External links . . . 451

67 Euonymus europaeus **454**
67.1 Description . . . 454
67.2 Cultivation and uses . . . 455
67.3 Synonyms . . . 455
67.4 Gallery . . . 455
67.5 References . . . 455
67.6 External links . . . 456

68 Salix caprea **457**
68.1 Ecology . . . 457
68.2 Cultivation and uses . . . 458
68.3 References . . . 458
68.4 External links . . . 458

69 Salix cinerea **460**
69.1 Plant . . . 460
69.2 Ecology . . . 460
69.3 Invasive species . . . 460
69.4 References . . . 461

70 Salix purpurea **463**
70.1 References . . . 464

71 Salix viminalis **465**
71.1 Description . . . 465

71.2 Distribution and habitat . . . 465
71.3 Uses . . . 465
71.4 References . . . 465

72 Salix aurita **467**

73 Viburnum opulus **469**
73.1 Names . . . 469
73.2 Description . . . 470
73.3 Cultivation . . . 470
73.4 Other uses . . . 470
73.5 Cultural meaning . . . 471
73.6 References . . . 471

74 Viburnum lantana **472**
74.1 Cultivation and uses . . . 472
74.2 References . . . 472

75 Ligustrum vulgare **473**
75.1 Cultivation and uses . . . 474
75.2 Invasiveness . . . 474
75.3 Gallery . . . 474
75.4 References . . . 474
75.5 Text and image sources, contributors, and licenses . . . 476
75.5.1 Text . . . 476
75.5.2 Images . . . 493
75.5.3 Content license . . . 506

Chapter 1

Alder

For other uses, see Alder (disambiguation).

Alder is the common name of a genus of flowering plants (***Alnus***) belonging to the birch family Betulaceae. The genus comprises about 30 species of monoecious trees and shrubs, a few reaching a large size, distributed throughout the north temperate zone with a few species extending into Central America and the northern Andes.*[1]

1.1 Etymology

The common name "alder" evolved from Old English "alor", which in turn is derived from Proto-Germanic root *aliso*. The generic name *Alnus* is the equivalent Latin name. Both the Latin and the Germanic words derive from the Proto-Indo-European root *el-*, meaning "red" or "brown", which is also a root for the English words "elk" and another tree: "elm", a tree distantly related to the alders..

1.2 Description

With a few exceptions, alders are deciduous, and the leaves are alternate, simple, and serrated. The flowers are catkins with elongate male catkins on the same plant as shorter female catkins, often before leaves appear; they are mainly wind-pollinated, but also visited by bees to a small extent. These trees differ from the birches (*Betula*, the other genus in the family) in that the female catkins are woody and do not disintegrate at maturity, opening to release the seeds in a similar manner to many conifer cones.

The largest species are red alder (*A. rubra*) on the west coast of North America, and black alder (*A. glutinosa*), native to most of Europe and widely introduced elsewhere, both reaching over 30 m. By contrast, the widespread *Alnus viridis* (green alder) is rarely more than a 5-m-tall shrub.

1.3 Ecology

Alder leaves and sometimes catkins are used as food by numerous butterflies and moths.

A. glutinosa and *A. viridis* are classed as environmental weeds in New Zealand.*[2]

1.3.1 Nitrogen fixation

Alder is particularly noted for its important symbiotic relationship with *Frankia alni*, an actinomycete, filamentous, nitrogen-fixing bacterium. This bacterium is found in root nodules, which may be as large as a human fist, with many small lobes, and light brown in colour. The bacterium absorbs nitrogen from the air and makes it available to the tree. Alder, in turn, provides the bacterium with sugars, which it produces through photosynthesis. As a result of

this mutually beneficial relationship, alder improves the fertility of the soil where it grows, and as a pioneer species, it helps provide additional nitrogen for the successional species which follow.

Whole root nodule

Sectioned root nodules
Alder root nodules

1.3.2 Parasites

Alder roots are parasitized by northern groundcone.

1.4 Uses

The catkins of some alder species have a degree of edibility,*[3] and may be rich in protein. Reported to have a bitter and unpleasant taste, they are more useful for survival purposes. The wood of certain alder species is often used to smoke various food items such as coffee, salmon and other seafood.

Most of the pilings that form the foundation of Venice were made from alder trees.*[4]

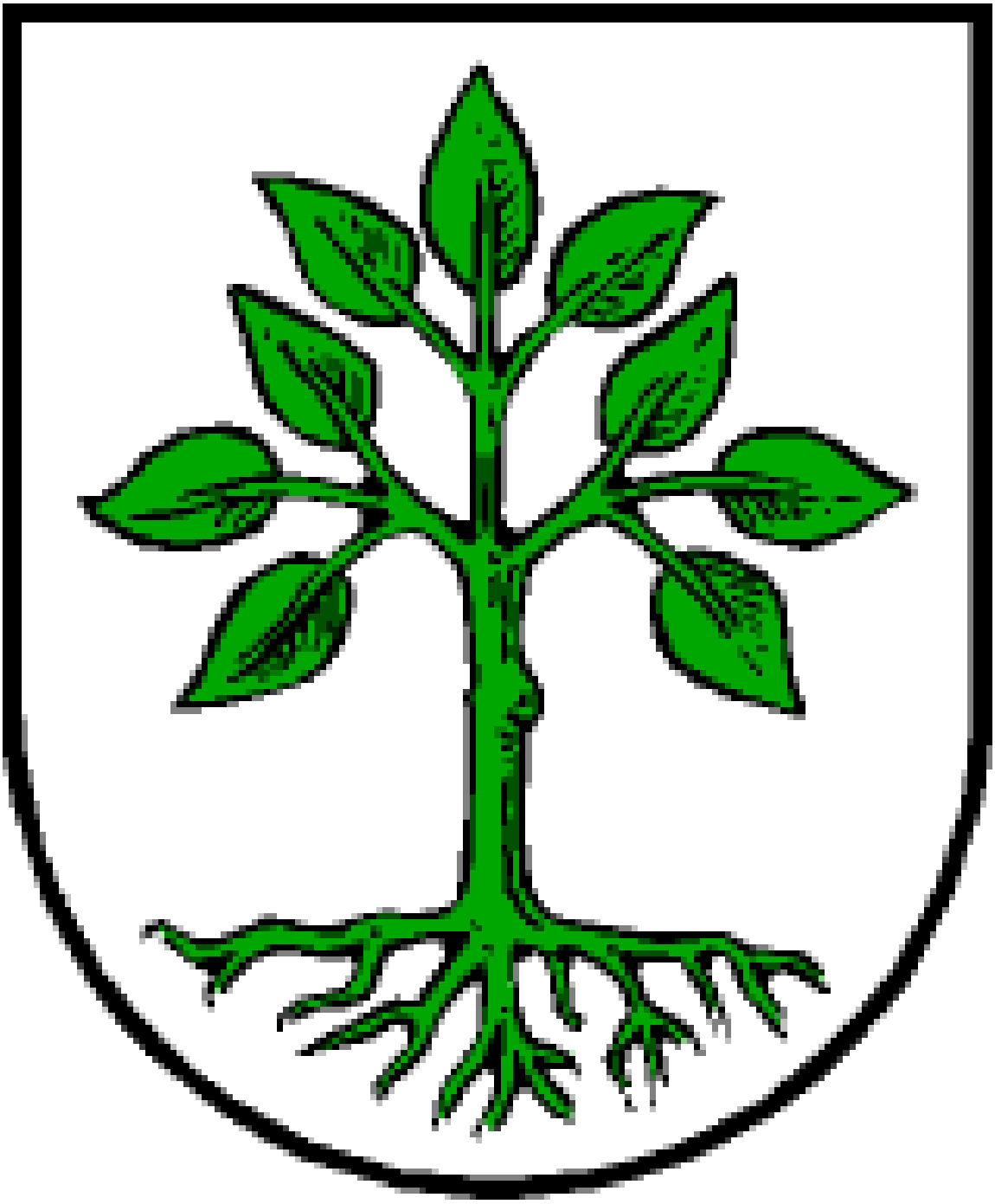
Alder bark contains the anti-inflammatory salicin, which is metabolized into salicylic acid in the body.*[5] Some Native American cultures use red alder bark *(Alnus rubra)* to treat poison oak, insect bites, and skin irritations. Blackfeet Indians have traditionally used an infusion made from the bark of red alder to treat lymphatic disorders and tuberculosis. Recent clinical studies have verified that red alder contains betulin and lupeol, compounds shown to be effective against a variety of tumors.*[6]

The inner bark of the alder, as well as red osier dogwood, or chokecherry, is used by some Indigenous peoples of the Americas in smoking mixtures, known as *kinnikinnick*, to improve the taste of the bearberry leaf.*[7]

Alder is illustrated in the coat of arms for the Austrian town of Grossarl.

Electric guitars, most notably the Fender Jazz Bass, Fender Precision Bass, Fender Stratocaster and Fender Telecaster, have been built with alder bodies since the 1950s. Alder is appreciated for its claimed tight and even balanced tone, especially when compared to mahogany, and has been adopted by many electric guitar manufacturers.

As a hardwood, alder is used in making furniture, cabinets, and other woodworking products. For example, in



Alder coat of arms of Grossarl, Austria

the television series *Northern Exposure* 1992 season 3 episode "Things Become Extinct", Native American Ira Wingfeather makes duck flutes out of Alder tree branches while Ed Chigliak films.

Alder bark and wood (like oak & sweet chestnut) contain tannin and are traditionally used to tan leather.

A red dye can also be extracted from the outer bark, and a yellow dye from the inner bark.*[8]

1.5 Classification

The genus is divided into three subgenera:

Subgenus *Alnus*: Trees with stalked shoot buds, male and female catkins produced in autumn (fall) but stay closed over winter, pollinating in late winter or early spring, about 15–25 species, including:

- *Alnus acuminata* Kunth —Andean alder, Mexico, Central, South America
- *Alnus cordata* (Loisel.) Duby —Italian alder, Italy, Albania, Corsica; naturalized in Belgium, Spain, Azores, California
- *Alnus cremastogyne* Burkill - China
- *Alnus* × *elliptica* Req. - Italy *(A. cordata* × *A. glutinosa)*
- *Alnus* × *fallacina* Callier - Ohio, New York State, Vermont, New Hampshire, Maine *(A. incana* subsp. *rugosa* × *A. serrulata)*
- *Alnus firma* Siebold & Zucc. —Kyūshū Island in Japan
- *Alnus glutinosa* (L.) Gaertn. —black alder, Europe, Central Asia; naturalized in New Zealand, Chile, Ontario, northeastern United States

*Speckled alder (*Alnus incana *subsp.* rugosa*)—leaves*

- *Alnus* × *hanedae* Suyinata - Japan *(A. firma* × *A. sieboldiana)*
- *Alnus incana* (L.) Moench —grey alder, Eurasia, North America
- *Alnus hirsuta* (Spach) Rupr. (*A. incana* subsp. *hirsuta*) —Manchurian alder, Japan, Korea, Manchuria, Siberia, Russian Far East
- Alnus × hosoii Mizush. - Japan *(A. maximowiczii* × *A. pendula)*
- *Alnus oblongifolia* Torr. (*A. incana* subsp. *oblongifolia*) —Arizona alder, Arizona, New Mexico, Sonora, Chihuahua
- *Alnus rugosa* (Du Roi) Spreng. (*A. incana* subsp. *rugosa*) —speckled alder, northeastern North America

- *Alnus tenuifolia* Nutt. (*A. incana* subsp. *tenuifolia*) —thinleaf or mountain alder, northwestern North America
- *Alnus japonica* (Thunb.) Steud. —Japanese alder, Japan, Korea, Taiwan, eastern China, Russian Far East
- *Alnus jorullensis* Kunth —Mexican alder, Mexico, Guatemala, Honduras (one of the few evergreen species)
- *Alnus mandshurica* (Callier) Hand.-Mazz. —Russian Far East, northeastern China, Korea
- *Alnus matsumurae* Callier —Honshū Island in Japan
- *Alnus* × *mayrii* Callier - Russian Far East, Japan *(A. hirsuta* × *A. japonica)*
- *Alnus nepalensis* D.Don —Nepalese alder, Himalayas, Tibet, Yunnan, Nepal, Bhutan, Myanmar, Thailand; naturalized in Hawaii
- *Alnus orientalis* Decne. —Oriental alder, southern Turkey, northwest Syria, Cyprus, Lebanon, Palestine, Iran
- *Alnus* × *peculiaris* Hiyama - Kyūshū Island in Japan *(A. firma* × *A. pendula)*
- *Alnus pendula* Matsum. —Japan, Korea
- *Alnus* × *pubescens* Tausch - northern + central Europe *(A. glutinosa* × *A. incana)*
- *Alnus rhombifolia* Nutt. —white alder, California, Nevada, Oregon, Washington, Idaho, Montana
- *Alnus rubra* Bong. —red alder, Alaska, Yukon, British Columbia, California, Oregon, Washington, Idaho, Montana

Leaves of the tag alder

- *Alnus serrulata* (Aiton) Willd. —hazel alder, tag alder or smooth alder, eastern North America
- *Alnus sieboldiana* Matsum. —Japan, Ryukyu Islands
- *Alnus subcordata* C.A.Mey. - Caucasian alder, Caucasus, Iran
- *Alnus trabeculosa* Hand.-Mazz. —China, Japan

Subgenus *Clethropsis*. Trees or shrubs with stalked shoot buds, male and female catkins produced in autumn (fall) and expanding and pollinating then, three species:

- *Alnus formosana* (Burkill) Makino —Formosan alder, Taiwan
- *Alnus maritima* (Marshall) Muhl. ex Nutt. —seaside alder, United States (Georgia, Delaware, Maryland, Oklahoma)
- *Alnus nitida* (Spach) Endl. —Himalayan alder, western Himalaya, Pakistan, India, Nepal

Subgenus *Alnobetula*. Shrubs with shoot buds not stalked, male and female catkins produced in late spring (after leaves appear) and expanding and pollinating then, one to four species:

*Green Alder (*Alnus viridis*)*

- *Alnus alnobetula* (Ehrh.) K.Koch (syn. *Alnus viridis* A. Gray 1848, illegitimate homonym, not (Chaix) DC. 1805) - temperate + subarctic Europe, Asia, North America

unknown subgenus

- *Alnus djavanshirii* H.Zare - Iran
- *Alnus dolichocarpa* H.Zare, Amini & Assadi - Iran
- *Alnus fauriei* H.Lév. & Vaniot - Honshu Island in Japan
- *Alnus ferdinandi-coburgii* C.K.Schneid. - southern China
- *Alnus glutipes* (Jarm. ex Czerpek) Vorosch. - Yakutiya region of Siberia
- *Alnus hakkodensis* Hayashi - Honshu Island in Japan
- *Alnus henryi* C.K.Schneid. - Taiwan

- *Alnus lanata* Duthie ex Bean - Sichuan Province in China
- *Alnus mairei* H.Lév. - Yunnan Province in China
- *Alnus maximowiczii* Callier - Japan, Korea, Russian Far East
- *Alnus paniculata* Nakai - Korea
- *Alnus serrulatoides* Callier - Japan
- *Alnus* × *suginoi* Sugim. - Japan
- *Alnus vermicularis* Nakai - Korea

1.6 References

[1] Kew World Checklist of Selected Plant Families

[2] Clayson, Howell (May 2008). *Consolidated list of environmental weeds in New Zealand*. Wellington: Department of Conservation. ISBN 978-0-478-14412-3.

[3] Plants For A Future (Database)

[4] Kendall, Paul (25 August 2010). "Mythology and Folklore of the Alder". Trees for life. Retrieved 6 August 2011.

[5] Ewing, Susan. The Great Alaska Nature Factbook. Portland: Alaska Northwest Books, 1996.

[6] Edible and Medicinal Plants of the West, Gregory L. Tilford, ISBN 0-87842-359-1

[7] Staff (2009) "Bearberry" *Discovering Lewis and Clark* The Lewis and Clark Fort Mandan Foundation

[8] "Native Plant Dyes". United States Department of Agriculture Forest Service. Retrieved 17 December 2014.

1.7 Further reading

- Chen, Zhiduan and Li, Jianhua (2004). Phylogenetics and Biogeography of *Alnus* (Betulaceae) Inferred from Sequences of Nuclear Ribosomal DNA ITS Region. *International Journal of Plant Sciences* 165: 325–335.

1.8 External links

- Flora Europaea: *Alnus*
- Flora of Bolivia: *Alnus*
- Flora of China: *Alnus*
- Flora of North America: *Alnus*
- Flora of Pakistan: *Alnus*

Chapter 2

Apple

This article is about the fruit. For the technology company, see Apple Inc. For other uses, see Apple (disambiguation) or Apple tree (disambiguation).

The **apple tree** (*Malus domestica*) is a deciduous tree in the rose family best known for its sweet, pomaceous fruit, the **apple**. It is cultivated worldwide as a fruit tree, and is the most widely grown species in the genus *Malus*. The tree originated in Central Asia, where its wild ancestor, *Malus sieversii*, is still found today. Apples have been grown for thousands of years in Asia and Europe, and were brought to North America by European colonists. Apples have religious and mythological significance in many cultures, including Norse, Greek and European Christian traditions.

Apple trees are large if grown from seed, but small if grafted onto roots (rootstock). There are more than 7,500 known cultivars of apples, resulting in a range of desired characteristics. Different cultivars are bred for various tastes and uses, including cooking, eating raw and cider production. Apples are generally propagated by grafting, although wild apples grow readily from seed. Trees and fruit are prone to a number of fungal, bacterial and pest problems, which can be controlled by a number of organic and non-organic means. In 2010, the fruit's genome was decoded as part of research on disease control and selective breeding in apple production.

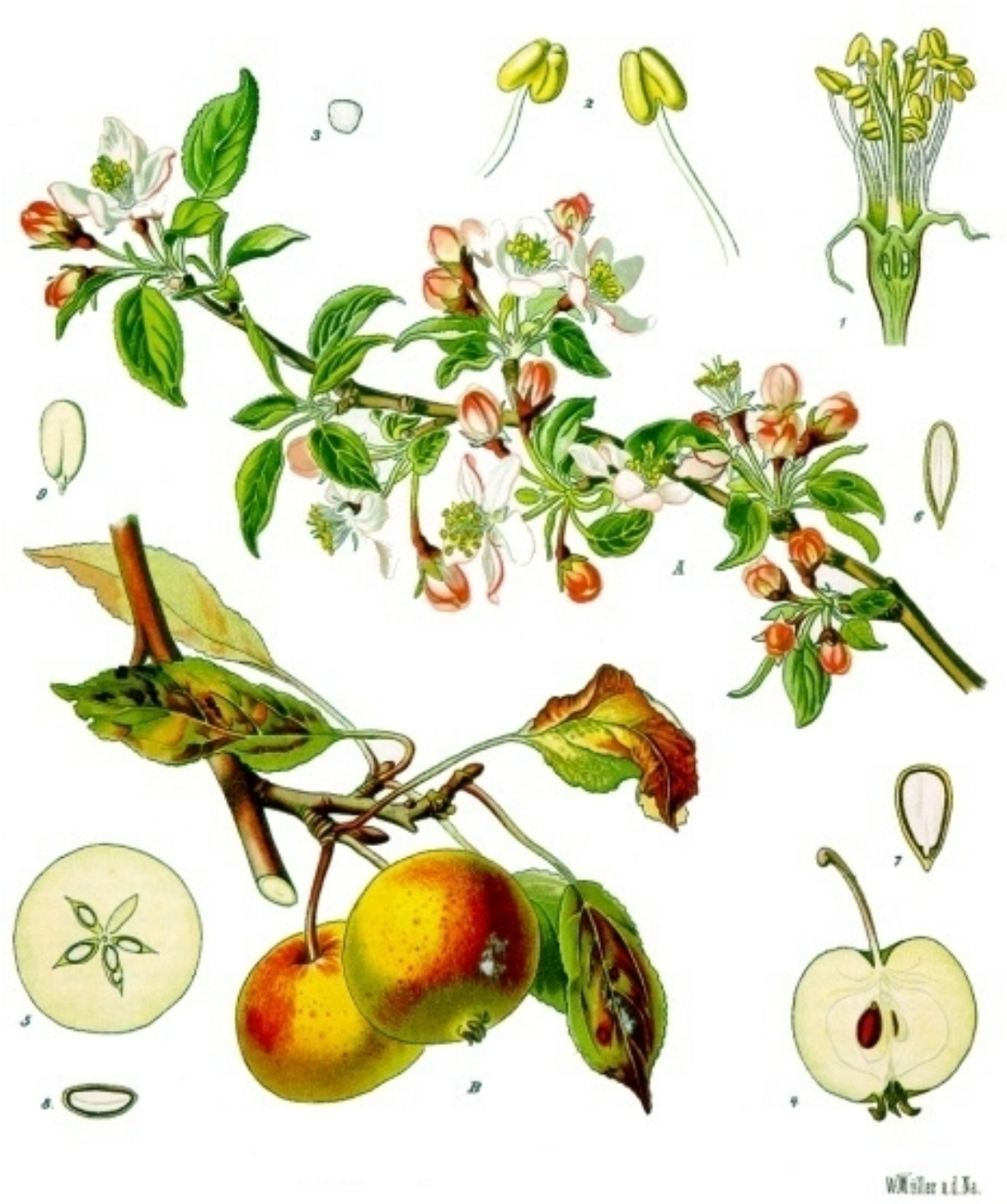
About 69 million tons of apples were grown worldwide in 2010, and China produced almost half of this total. The United States is the second-leading producer, with more than 6% of world production. Turkey is third, followed by Italy, India and Poland. Apples are often eaten raw, but can also be found in many prepared foods (especially desserts) and drinks. Many beneficial health effects are thought to result from eating apples; however, two types of allergies are attributed to various proteins found in the fruit.

2.1 Botanical information

The apple is a deciduous tree, generally standing 1.8 to 4.6 m (6 to 15 ft) tall in cultivation and up to 39 ft (12 m) in the wild.[*][3] When cultivated, the size, shape and branch density are determined by rootstock selection and trimming method. The leaves are alternately arranged dark green-colored simple ovals with serrated margins and slightly downy undersides.[*][4]

Blossoms are produced in spring simultaneously with the budding of the leaves, and are produced on spurs and some long shoots. The 3 to 4 cm (1.2 to 1.6 in) flowers are white with a pink tinge that gradually fades, five petaled, with an inflorescence consisting of a cyme with 4–6 flowers. The central flower of the inflorescence is called the "king bloom"; it opens first, and can develop a larger fruit.[*][4][*][5]

The fruit matures in late summer or autumn, and varieties exist with a wide range of sizes. Commercial growers aim to produce an apple that is 7.0 to 8.3 cm (2.75 to 3.25 in) in diameter, due to market preference. Some consumers, especially those in Japan, prefer a larger apple, while apples below 5.7 cm (2.25 in) are generally used for making juice and have little fresh market value. The skin of ripe apples is generally red, yellow, green, pink, or russetted although many bi- or tri-colored varieties may be found.[*][6] The skin may also be wholly or partly russeted i.e. rough and brown. The skin is covered in a protective layer of epicuticular wax,[*][7] The flesh is generally pale yellowish-white,[*][6] though pink or yellow flesh is also known.



*Blossoms, fruits, and leaves of the apple tree (*Malus domestica*)*

2.1.1 Wild ancestors

Main article: Malus sieversii

The original wild ancestor of *Malus domestica* was *Malus sieversii*, found growing wild in the mountains of Central Asia in southern Kazakhstan, Kyrgyzstan, Tajikistan, and Xinjiang, China.[*][4][*][8] Cultivation of the species, most likely beginning on the forested flanks of the Tian Shan mountains, progressed over a long period of time and permitted secondary introgression of genes from other species into the open-pollinated seeds. Significant exchange with *Malus sylvestris*, the crabapple, resulted in current populations of apples being more related to crabapples than to the

more morphologically similar progenitor *Malus sieversii*. In strains without recent admixture the contribution of the latter predominates.[*][9][*][10][*][11]

2.1.2 Genome

In 2010, an Italian-led consortium announced they had decoded the complete genome of the apple in collaboration with horticultural genomicists at Washington State University,[*][12] using the Golden delicious variety.[*][13] It had about 57,000 genes, the highest number of any plant genome studied to date[*][14] and more genes than the human genome (about 30,000).[*][15] This new understanding of the apple genome will help scientists in identifying genes and gene variants that contribute to resistance to disease and drought, and other desirable characteristics. Understanding the genes behind these characteristics will allow scientists to perform more knowledgeable selective breeding. Decoding the genome also provided proof that *Malus sieversii* was the wild ancestor of the domestic apple—an issue that had been long-debated in the scientific community.[*][16]

2.2 History

Wild Malus sieversii *apple in Kazakhstan*

The center of diversity of the genus *Malus* is in eastern Turkey. The apple tree was perhaps the earliest tree to be cultivated,[*][17] and its fruits have been improved through selection over thousands of years. Alexander the Great is credited with finding dwarfed apples in Kazakhstan in 328 BCE;[*][4] those he brought back to Macedonia might have been the progenitors of dwarfing root stocks. Winter apples, picked in late autumn and stored just above freezing, have been an important food in Asia and Europe for millennia.[*][17]

Apples were brought to North America by colonists in the 17th century,[*][4] and the first apple orchard on the North American continent was planted in Boston by Reverend William Blaxton in 1625.[*][18] The only apples native to North America are crab apples, which were once called "common apples".[*][19] Apple varieties brought as seed from Europe were spread along Native American trade routes, as well as being cultivated on Colonial farms. An 1845 United States

apples nursery catalogue sold 350 of the "best" varieties, showing the proliferation of new North American varieties by the early 19th century.*[19] In the 20th century, irrigation projects in Eastern Washington began and allowed the development of the multibillion dollar fruit industry, of which the apple is the leading product.*[4]

Until the 20th century, farmers stored apples in frostproof cellars during the winter for their own use or for sale. Improved transportation of fresh apples by train and road replaced the necessity for storage.*[20]*[21] In the 21st century, long-term storage again came into popularity, as "controlled atmosphere" facilities were used to keep apples fresh year-round. Controlled atmosphere facilities use high humidity, low oxygen, and controlled carbon dioxide levels to maintain fruit freshness.*[22]*[23]

2.3 Cultural aspects

Main article: Apple (symbolism)

2.3.1 Germanic paganism

In Norse mythology, the goddess Iðunn is portrayed in the *Prose Edda* (written in the 13th century by Snorri Sturluson) as providing apples to the gods that give them eternal youthfulness. English scholar H. R. Ellis Davidson links apples to religious practices in Germanic paganism, from which Norse paganism developed. She points out that buckets of apples were found in the Oseberg ship burial site in Norway, and that fruit and nuts (Iðunn having been described as being transformed into a nut in *Skáldskaparmál*) have been found in the early graves of the Germanic peoples in England and elsewhere on the continent of Europe, which may have had a symbolic meaning, and that nuts are still a recognized symbol of fertility in southwest England.*[24]

Davidson notes a connection between apples and the Vanir, a tribe of gods associated with fertility in Norse mythology, citing an instance of eleven "golden apples" being given to woo the beautiful Gerðr by Skírnir, who was acting as messenger for the major Vanir god Freyr in stanzas 19 and 20 of *Skírnismál*. Davidson also notes a further connection between fertility and apples in Norse mythology in chapter 2 of the *Völsunga saga* when the major goddess Frigg sends King Rerir an apple after he prays to Odin for a child, Frigg's messenger (in the guise of a crow) drops the apple in his lap as he sits atop a mound.*[25] Rerir's wife's consumption of the apple results in a six-year pregnancy and the Caesarean section birth of their son—the hero Völsung.*[26]

Further, Davidson points out the "strange" phrase "Apples of Hel" used in an 11th-century poem by the skald Thorbiorn Brúnarson. She states this may imply that the apple was thought of by Brúnarson as the food of the dead. Further, Davidson notes that the potentially Germanic goddess Nehalennia is sometimes depicted with apples and that parallels exist in early Irish stories. Davidson asserts that while cultivation of the apple in Northern Europe extends back to at least the time of the Roman Empire and came to Europe from the Near East, the native varieties of apple trees growing in Northern Europe are small and bitter. Davidson concludes that in the figure of Iðunn "we must have a dim reflection of an old symbol: that of the guardian goddess of the life-giving fruit of the other world." *[24]

2.3.2 Greek mythology

Apples appear in many religious traditions, often as a mystical or forbidden fruit. One of the problems identifying apples in religion, mythology and folktales is that the word "apple" was used as a generic term for all (foreign) fruit, other than berries, including nuts, as late as the 17th century.*[27] For instance, in Greek mythology, the Greek hero Heracles, as a part of his Twelve Labours, was required to travel to the Garden of the Hesperides and pick the golden apples off the Tree of Life growing at its center.*[28]*[29]*[30]

The Greek goddess of discord, Eris, became disgruntled after she was excluded from the wedding of Peleus and Thetis.*[31] In retaliation, she tossed a golden apple inscribed Καλλίστη (*Kalliste*, sometimes transliterated *Kallisti*, 'For the most beautiful one'), into the wedding party. Three goddesses claimed the apple: Hera, Athena, and Aphrodite. Paris of Troy was appointed to select the recipient. After being bribed by both Hera and Athena, Aphrodite tempted him with the most beautiful woman in the world, Helen of Sparta. He awarded the apple to Aphrodite, thus indirectly causing the Trojan War.

The apple was thus considered, in ancient Greece, to be sacred to Aphrodite, and to throw an apple at someone was to symbolically declare one's love; and similarly, to catch it was to symbolically show one's acceptance of that love.*[32]

"*Brita as Iduna" (1901) by Carl Larsson*

An epigram claiming authorship by Plato states:

> I throw the apple at you, and if you are willing to love me, take it and share your girlhood with me; but if your thoughts are what I pray they are not, even then take it, and consider how short-lived is beauty.

—Plato, Epigram VII*[33]

Atalanta, also of Greek mythology, raced all her suitors in an attempt to avoid marriage. She outran all but Hippomenes (also known as Melanion, a name possibly derived from *melon* the Greek word for both "apple" and fruit in general),*[29] who defeated her by cunning, not speed. Hippomenes knew that he could not win in a fair race, so he used three golden apples (gifts of Aphrodite, the goddess of love) to distract Atalanta. It took all three apples and all of his speed, but Hippomenes was finally successful, winning the race and Atalanta's hand.*[28]

2.3.3 The forbidden fruit in the Garden of Eden

Though the forbidden fruit of Eden in the Book of Genesis is not identified, popular Christian tradition has held that it was an apple that Eve coaxed Adam to share with her.*[34] The origin of the popular identification with a fruit unknown in the Middle East in biblical times is found in confusion between the Latin words *mālum* (an apple) and *mălum* (an evil), each of which is normally written *malum*.*[35] The tree of the forbidden fruit is called "the tree of the knowledge of good and evil" in Genesis 2:17, and the Latin for "good and evil" is *bonum et malum*.*[36]

Renaissance painters may also have been influenced by the story of the golden apples in the Garden of Hesperides. As a result, in the story of Adam and Eve, the apple became a symbol for knowledge, immortality, temptation, the fall of man into sin, and sin itself. The larynx in the human throat has been called Adam's apple because of a notion that it was caused by the forbidden fruit remaining in the throat of Adam.*[34] The apple as symbol of sexual seduction has been used to imply human sexuality, possibly in an ironic vein.*[34]

2.4 Cultivars

Main article: List of apple cultivars

There are more than 7,500 known cultivars of apples.*[37] Cultivars vary in their yield and the ultimate size of the tree, even when grown on the same rootstock.*[38] Different cultivars are available for temperate and subtropical climates. The UK's National Fruit Collection, which is the responsibility of the Department of Environment Food and Rural Affairs, includes a collection of over 2,000 varieties of apple tree in Kent.*[39] The University of Reading, which is responsible for developing the UK national collection database, provides access to search the national collection. The University of Reading's work is part of the European Cooperative Programme for Plant Genetic Resources of which there are 38 countries participating in the Malus/Pyrus work group.*[40]

The UK's national fruit collection database contains a wealth of information on the characteristics and origin of many apples, including alternative names for what is essentially the same 'genetic' apple variety. Most of these cultivars are bred for eating fresh (dessert apples), though some are cultivated specifically for cooking (cooking apples) or producing cider. Cider apples are typically too tart and astringent to eat fresh, but they give the beverage a rich flavor that dessert apples cannot.*[41]

Commercially popular apple cultivars are soft but crisp. Other desired qualities in modern commercial apple breeding are a colorful skin, absence of russeting, ease of shipping, lengthy storage ability, high yields, disease resistance, common apple shape, and developed flavor.*[38] Modern apples are generally sweeter than older cultivars, as popular tastes in apples have varied over time. Most North Americans and Europeans favor sweet, subacid apples, but tart apples have a strong minority following.*[42] Extremely sweet apples with barely any acid flavor are popular in Asia*[42] and especially Indian Subcontinent .*[41]

Old cultivars are often oddly shaped, russeted, and have a variety of textures and colors. Some find them to have a better flavor than modern cultivars,*[43] but they may have other problems which make them commercially unviable from low yield, disease susceptibility, poor tolerance for storage or transport, or just being the 'wrong' size. A few old cultivars are still produced on a large scale, but many have been preserved by home gardeners and farmers that sell directly to local markets. Many unusual and locally important cultivars with their own unique taste and appearance exist; apple conservation campaigns have sprung up around the world to preserve such local cultivars from extinction. In the United Kingdom, old cultivars such as 'Cox's Orange Pippin' and 'Egremont Russet' are still commercially important even though by modern standards they are low yielding and susceptible to disease.*[4]

2.5 Cultivation

2.5.1 Breeding

See also: Fruit tree propagation and Malling series

In the wild, apples grow readily from seeds. However, like most perennial fruits, apples are ordinarily propagated asexually by grafting. This is because seedling apples are an example of "extreme heterozygotes", in that rather than inheriting DNA from their parents to create a new apple with those characteristics, they are instead significantly different from their parents.*[44] Triploid varieties have an additional reproductive barrier in that 3 sets of chromosomes cannot be divided evenly during meiosis, yielding unequal segregation of the chromosomes (aneuploids). Even in the case when a triploid plant can produce a seed (apples are an example), it occurs infrequently, and seedlings rarely survive.*[45]

Because apples do not breed true when planted as seeds, grafting is generally used to produce new apple trees. The rootstock used for the bottom of the graft can be selected to produce trees of a large variety of sizes, as well as changing the winter hardiness, insect and disease resistance, and soil preference of the resulting tree. Dwarf rootstocks can be used to produce very small trees (less than 3.0 m (10 ft) high at maturity), which bear fruit earlier in their life cycle than full size trees.*[46] Dwarf rootstocks for apple trees can be traced as far back as 300 BC, to the area of Persia and Asia Minor. Alexander the Great sent samples of dwarf apple trees to Aristotle's Lyceum. Dwarf rootstocks became common by the 15th century, and later went through several cycles of popularity and decline throughout the world.*[47] The majority of the rootstocks used today to control size in apples were developed in England in the early 1900s. The East Malling Research Station conducted extensive research into rootstocks, and today their rootstocks are given an "M" prefix to designate their origin. Rootstocks marked with an "MM" prefix are Malling-series varieties later crossed with trees of the Northern Spy variety in Merton, England.*[48]

Most new apple cultivars originate as seedlings, which either arise by chance or are bred by deliberately crossing cultivars with promising characteristics.*[49] The words 'seedling', 'pippin', and 'kernel' in the name of an apple cultivar suggest that it originated as a seedling. Apples can also form bud sports (mutations on a single branch). Some bud sports turn out to be improved strains of the parent cultivar. Some differ sufficiently from the parent tree to be considered new cultivars.*[50]

Since the 1930s, the Excelsior Experiment Station at the University of Minnesota has introduced a steady progression of important apples that are widely grown, both commercially and by local orchardists, throughout Minnesota and Wisconsin. Its most important contributions have included 'Haralson' (which is the most widely cultivated apple in Minnesota), 'Wealthy', 'Honeygold', and 'Honeycrisp'.

Apples have been acclimatized in Ecuador at very high altitudes, where they provide crops twice per year because of constant temperate conditions year-round.*[51]

- **Alice**
- **Ananasrenette**
- Aroma
- **Discovery**
- **Bramley**
- **Arkansas Black**
- **Fuji**
- **Golden delicious**
- **Goldrenette**
- **Gala**
- **Red Delicious**
- **Jonagold**
- **James Grieve**

- **Granny Smith**
- **McIntosh**
- **Yellow Transparent**
- **Pacific rose**
- **Lobo**
- **Sampion** (Shampion)
- **Summerred**
- **Pink Lady**
- **Belle de Boskoop**
- **Red Delicious**
- **Cox Pomona**

2.5.2 Pollination

See also: Fruit tree pollination

Apples are self-incompatible; they must cross-pollinate to develop fruit. During the flowering each season, apple growers often utilize pollinators to carry pollen. Honey bees are most commonly used. Orchard mason bees are also used as supplemental pollinators in commercial orchards. Bumblebee queens are sometimes present in orchards, but not usually in enough quantity to be significant pollinators.*[50]

There are four to seven pollination groups in apples, depending on climate:

- Group A – Early flowering, 1 to 3 May in England (Gravenstein, Red Astrachan)
- Group B – 4 to 7 May (Idared, McIntosh)
- Group C – Mid-season flowering, 8 to 11 May (Granny Smith, Cox's Orange Pippin)
- Group D – Mid/late season flowering, 12 to 15 May (Golden Delicious, Calville blanc d'hiver)
- Group E – Late flowering, 16 to 18 May (Braeburn, Reinette d'Orléans)
- Group F – 19 to 23 May (Suntan)
- Group H – 24 to 28 May (Court-Pendu Gris - also called Court-Pendu plat)

One cultivar can be pollinated by a compatible cultivar from the same group or close (A with A, or A with B, but not A with C or D).*[52]

Varieties are sometimes classified by the day of peak bloom in the average 30-day blossom period, with pollenizers selected from varieties within a 6-day overlap period.

2.5.3 Maturation and harvest

See also: Fruit picking and Fruit tree pruning

Cultivars vary in their yield and the ultimate size of the tree, even when grown on the same rootstock. Some cultivars, if left unpruned, will grow very large, which allows them to bear much more fruit, but makes harvesting very difficult. Depending on the tree density (number of trees planted per unit surface area), mature trees typically bear 40–200 kg (88–441 lb) of apples each year, though productivity can be close to zero in poor years. Apples are harvested using three-point ladders that are designed to fit amongst the branches. Trees grafted on dwarfing rootstocks will bear about 10–80 kg (22–176 lb) of fruit per year.*[50]

Crops ripen at different times of the year according to the variety of apple. Varieties that yield their crop in the summer include Gala, Golden Supreme, McIntosh, Transparent, Primate, Sweet Bough, and Duchess; fall producers include Fuji, Jonagold, Golden Delicious, Red Delicious, Chenango, Gravenstein, Wealthy, McIntosh, Snow, and Blenheim; winter producers include Winesap, Granny Smith, King, Wagener, Swayzie, Greening, and Tolman Sweet.*[19]

2.5.4 Storage

Commercially, apples can be stored for some months in controlled-atmosphere chambers to delay ethylene-induced ripening. Apples are commonly stored in chambers with higher concentrations of carbon dioxide and high air filtration. This prevents ethylene concentrations from rising to higher amounts and preventing ripening from occurring too quickly. Ripening continues when the fruit is removed from storage.*[53] For home storage, most varieties of apple can be held for approximately two weeks when kept at the coolest part of the refrigerator (i.e. below 5 °C). Some types, including the Granny Smith and Fuji, can be stored up to a year without significant degradation.*[54]*[55]

2.5.5 Pests and diseases

Main article: List of apple diseases
See also: List of Lepidoptera that feed on Malus

Apple trees are susceptible to a number of fungal and bacterial diseases and insect pests. Many commercial orchards pursue an aggressive program of chemical sprays to maintain high fruit quality, tree health, and high yields. A trend in orchard management is the use of organic methods. These ban the use of some pesticides, though some older pesticides are allowed. Organic methods include, for instance, introducing its natural predator to reduce the population of a particular pest.

A wide range of pests and diseases can affect the plant; three of the more common diseases/pests are mildew, aphids and apple scab.

- Mildew: which is characterized by light grey powdery patches appearing on the leaves, shoots and flowers, normally in spring. The flowers will turn a creamy yellow color and will not develop correctly. This can be treated in a manner not dissimilar from treating Botrytis; eliminating the conditions which caused the disease in the first place and burning the infected plants are among the recommended actions to take.*[56]
- Aphids: There are five species of aphids commonly found on apples: apple grain aphid, rosy apple aphid, apple aphid, spirea aphid and the woolly apple aphid. The aphid species can be identified by their color, the time of year when they are present and by differences in the cornicles, which are small paired projections from the rear of aphids.*[56] Aphids feed on foliage using needle-like mouth parts to suck out plant juices. When present in high numbers, certain species reduce tree growth and vigor.*[57]
- Apple scab: Apple scab causes leaves to develop olive-brown spots with a velvety texture that later turn brown and become cork-like in texture. The disease also affects the fruit, which also develops similar brown spots with velvety or cork-like textures. Apple scab is spread through fungus growing in old apple leaves on the ground and spreads during warm spring weather to infect the new year's growth.*[58]

Among the most serious disease problems are fireblight, a bacterial disease; and *Gymnosporangium* rust, and black spot, two fungal diseases.*[57] Codling moths and apple maggots are two other pests which affect apple trees. Young apple trees are also prone to mammal pests like mice and deer, which feed on the soft bark of the trees, especially in winter.*[58]

2.6 Production

Main article: List of countries by apple production

About 63 million tonnes of apples were grown worldwide in 2012, with China producing almost half of this total. The United States is the second-leading producer, with more than 6% of world production. The largest exporters of

apples in 2009 were China, U.S., Turkey, Poland, Italy, Iran, and India while the biggest importers in the same year were Russia, Germany, the UK and the Netherlands.*[60]

In the United States, more than 60% of all the apples sold commercially are grown in Washington.*[61] Imported apples from New Zealand and other more temperate areas are competing with U.S. production and increasing each year.*[62]

Most of Australia's apple production is for domestic consumption. Imports from New Zealand have been disallowed under quarantine regulations for fireblight since 1921.*[63]

Other countries with a significant production are Brazil, Argentina, Ukraine, Germany and South Africa.

2.7 Nutrition

According to the United States Department of Agriculture, a typical apple serving weighs 242 grams and contains 126 calories with significant dietary fiber and modest vitamin C content, with otherwise a generally low content of essential nutrients (table, right).*[64]

2.7.1 Phytochemicals

Apple peels contain various phytochemicals with unknown nutritional value,*[65] including quercetin, epicatechin, and procyanidin B2.*[65] Preliminary research is investigating whether nutrients and/or phytochemicals in apples may affect the risk of some types of cancer.*[66]

2.8 Human consumption

See also: Cooking apple and Cider apple

Apples are often eaten raw. The whole fruit including the skin is suitable for human consumption except for the seeds, which may affect some consumers. The core is often not eaten and is discarded. Varieties bred for raw consumption are termed dessert or table apples.

Apples can be canned or juiced. They are milled or pressed to produce apple juice, which may be drunk unfiltered (called apple cider in North America), or filtered. The juice can be fermented to make cider (called hard cider in North America), ciderkin, and vinegar. Through distillation, various alcoholic beverages can be produced, such as applejack, Calvados,*[67] and apfelwein. Apple seed oil*[68] and pectin may also be produced.

2.8.1 Popular uses

Apples are an important ingredient in many desserts, such as apple pie, apple crumble, apple crisp and apple cake. They are often eaten baked or stewed, and they can also be dried and eaten or reconstituted (soaked in water, alcohol or some other liquid) for later use. When cooked, some apple varieties easily form a puree known as apple sauce. Apples are also made into apple butter and apple jelly. They are also used (cooked) in meat dishes.

- In the UK, a toffee apple is a traditional confection made by coating an apple in hot toffee and allowing it to cool. Similar treats in the U.S. are candy apples (coated in a hard shell of crystallized sugar syrup), and caramel apples, coated with cooled caramel.
- Apples are eaten with honey at the Jewish New Year of Rosh Hashanah to symbolize a sweet new year.*[67]
- Farms with apple orchards may open them to the public, so consumers may themselves pick the apples they will purchase.*[67]

Sliced apples turn brown with exposure to air due to the conversion of natural phenolic substances into melanin upon exposure to oxygen.*[65] Different cultivars vary in their propensity to brown after slicing*[69] and the genetically engineered Arctic Apples do not brown. Sliced fruit can be treated with acidulated water to prevent this effect.*[65]

2.8.2 Organic production

Organic apples are commonly produced in the United States.*[70] Organic production is difficult in Europe, though a few orchards have done so with commercial success,*[70] using disease-resistant cultivars. A light coating of kaolin, which forms a physical barrier to some pests, also helps prevent apple sun scalding.*[50]*[70]

2.8.3 Allergy

One form of apple allergy, often found in northern Europe, is called birch-apple syndrome, and is found in people who are also allergic to birch pollen.*[71] Allergic reactions are triggered by a protein in apples that is similar to birch pollen, and people affected by this protein can also develop allergies to other fruits, nuts, and vegetables. Reactions, which entail oral allergy syndrome (OAS), generally involve itching and inflammation of the mouth and throat,*[71] but in rare cases can also include life-threatening anaphylaxis.*[72] This reaction only occurs when raw fruit is consumed—the allergen is neutralized in the cooking process. The variety of apple, maturity and storage conditions can change the amount of allergen present in individual fruits. Long storage times can increase the amount of proteins that cause birch-apple syndrome.*[71]

In other areas, such as the Mediterranean, some individuals have adverse reactions to apples because of their similarity to peaches.*[71] This form of apple allergy also includes OAS, but often has more severe symptoms, such as vomiting, abdominal pain and urticaria, and can be life-threatening. Individuals with this form of allergy can also develop reactions to other fruits and nuts. Cooking does not break down the protein causing this particular reaction, so affected individuals can eat neither raw nor cooked apples. Freshly harvested, over-ripe fruits tend to have the highest levels of the protein that causes this reaction.*[71]

Breeding efforts have yet to produce a hypoallergenic fruit suitable for either of the two forms of apple allergy.*[71]

2.8.4 Toxicity of seeds

The seeds of apples contain small amounts of amygdalin, a sugar and cyanide compound known as a cyanogenic glycoside. Ingesting small amounts of apple seeds will cause no ill effects, but in extremely large doses can cause adverse reactions. There is only one known case of fatal cyanide poisoning from apple seeds; in this case the individual chewed and swallowed one cup of seeds. It may take several hours before the poison takes effect, as cyanogenic glycosides must be hydrolyzed before the cyanide ion is released.*[73]

2.9 Proverbs

The proverb "*An apple a day keeps the doctor away*", addressing the health effects of the fruit, dates from 19th century Wales according to Caroline Taggart, author of "An Apple a Day: Old-Fashioned Proverbs and Why They Still Work." The original phrase, Taggart said, was, ''Eat an apple on going to bed, and you'll keep the doctor from earning his bread." In the 19th century and early 20th, the phrase evolved to "an apple a day, no doctor to pay" and "an apple a days sends the doctor away," while the phrasing now commonly used was first recorded in 1922.*[74]

2.10 See also

- Apple chips
- Applecrab, apple-crabapple hybrids with the good eating qualities of the apple parents
- Cooking apple
- List of apple dishes

2.11 References

[1] "*Malus pumila* auct." . *Germplasm Resources Information Network (GRIN) online database*. Retrieved 4 January 2012.

[2] "*Pyrus malus* L." . *Germplasm Resources Information Network (GRIN) online database*. Retrieved 29 January 2012.

[3] "Types and names of Apple Trees, Species of the Malus Genus" . Treenames.net. Retrieved 25 August 2014.

[4] "Origin, History of cultivation" . University of Georgia. Archived from the original on 21 January 2008. Retrieved 22 January 2008.

[5] "Apple" . Natural History Museum. Retrieved 5 September 2013.

[6] Jules Janick, James N. Cummins, Susan K. Brown, and Minou Hemmat (1996). "Chapter 1: Apples" . In Jules Janick and James N. Moore. *Fruit Breeding, Volume I: Tree and Tropical Fruits* (PDF). John Wiley & Sons, Inc. p. 9. ISBN 0-471-31014-X.

[7] "Natural Waxes on Fruits" . Postharvest.tfrec.wsu.edu. 29 October 2010. Retrieved 14 June 2013.

[8] Lauri, Pierre-éric; Karen Maguylo; Catherine Trottier (2006). "Architecture and size relations: an essay on the apple (Malus x domestica, Rosaceae) tree" . *American Journal of Botany* (Botanical Society of America, Inc.) **93** (93): 357–368. doi:10.3732/ajb.93.3.357.

[9] Amandine Cornille et al. (2012). Mauricio, Rodney, ed. "New Insight into the History of Domesticated Apple: Secondary Contribution of the European Wild Apple to the Genome of Cultivated Varieties" . *PLOS Genetics* **8** (5): e1002703. doi:10.1371/journal.pgen.1002703. PMC 3349737. PMID 22589740.

[10] Sam Kean (17 May 2012). "ScienceShot: The Secret History of the Domesticated Apple" .

[11] Coart, E., Van Glabeke, S., De Loose, M., Larsen, A.S., Roldán-Ruiz, I. 2006. Chloroplast diversity in the genus *Malus*: new insights into the relationship between the European wild apple (*Malus sylvestris* (L.) Mill.) and the domesticated apple (*Malus domestica* Borkh.). *Mol. Ecol.* **15(8)**: 2171–82.

[12] "Apple Cup Rivals Contribute to Apple Genome Sequencing" . Cahnrsnews.wsu.edu. 29 August 2010. Retrieved 28 December 2012.

[13] "The genome of the domesticated apple (Malus × domestica Borkh.)". Nature.com. Retrieved 28 December 2012.

[14] An Italian-led international research consortium decodes the apple genome AlphaGallileo 29 August 2010. Retrieved 19 October 2011.

[15] The Science Behind the Human Genome Project Human Genome Project Information, US Department of Energy, 26 March 2008. Retrieved 19 October 2011.

[16] Clark, Brian, Apple Cup Rivals Contribute to Apple Genome Sequencing, 29 August 2010, *Washington State University*, retrieved 19 October 2011.

[17] "An apple a day keeps the doctor away" . vegparadise.com. Archived from the original on 11 February 2008. Retrieved 27 January 2008.

[18] Smith, Archibald William (1997). *A Gardener's Handbook of Plant Names: Their Meanings and Origins*. Dover Publications. p. 39. ISBN 0-486-29715-2.

[19] Lawrence, James (1980). *The Harrowsmith Reader, Volume II*. Camden House Publishing Ltd. p. 122. ISBN 0-920656-10-2.

[20] James M. Van Valen (2010). *History of Bergen county, New Jersey*. Nabu Press. p. 744. ISBN 1-177-72589-4.

[21] Brox, Jane (2000). *Five Thousand Days Like This One: An American Family History*. Beacon Press. ISBN 978-0-8070-2107-1.

[22] "Controlled Atmosphere Storage" . Washington Apple Commission. Retrieved 3 April 2012.

[23] http://postharvest.tfrec.wsu.edu/EMK2001D.pdf

[24] Ellis Davidson, H. R. (1965) *Gods And Myths Of Northern Europe*, page 165 to 166. ISBN 0-14-013627-4

[25] Ellis Davidson, H. R. (1965) *Gods And Myths Of Northern Europe*, page 165 to 166. Penguin Books ISBN 0-14-013627-4

[26] Ellis Davidson, H. R. (1998) *Roles of the Northern Goddess*, page 146 to 147. Routledge ISBN 0-415-13610-5

[27] Sauer, Jonathan D. (1993). *Historical Geography of Crop Plants: A Select Roster*. CRC Press. p. 109. ISBN 0-8493-8901-1.

[28] Wasson, R. Gordon (1968). *Soma: Divine Mushroom of Immortality*. Harcourt Brace Jovanovich. p. 128. ISBN 0-15-683800-1.

[29] Ruck, Carl; Blaise Daniel Staples (2001). *The Apples of Apollo, Pagan and Christian Mysteries of the Eucharist*. Durham: Carolina Academic Press. pp. 64–70. ISBN 0-89089-924-X.

[30] Heinrich, Clark (2002). *Magic Mushrooms in Religion and Alchemy*. Rochester: Park Street Press. pp. 64–70. ISBN 0-89281-997-9.

[31] Herodotus *Histories* 6.1.191.

[32] Edmonds, J. M., trans.; rev. John M. Cooper. "Epigrams". *Plato: Complete Works*. Ed. John M. Cooper. Indianapolis: Hackett, 1997. p 1744, note to VII. Print.

[33] Edmonds, J. M., trans.; rev. John M. Cooper. "Epigrams". *Plato: Complete Works*. Ed. John M. Cooper. Indianapolis: Hackett, 1997. p 1744. Print.

[34] Macrone, Michael; Tom Lulevitch (1998). *Brush up your Bible!*. Tom Lulevitch. Random House Value. ISBN 0-517-20189-5. OCLC 38270894.

[35] *Paul J. Kissling, "Genesis" (College Press 2004 ISBN 978-0-89900875-2), vol. 1, p. 193*. Books.google.com. Retrieved 25 August 2014.

[36] *Hendel, "The Book of Genesis: A Biography" (Princeton University Press 2012 ISBN 978-0-69114012-4), p. 114*. Books.google.com. Retrieved 25 August 2014.

[37] Elzebroek, A.T.G.; Wind, K. (2008). *Guide to Cultivated Plants*. Wallingford: CAB International. p. 27. ISBN 1-84593-356-7.

[38] "Apple – Malus domestica". Natural England. Archived from the original on 12 May 2008. Retrieved 22 January 2008.

[39] ""National Fruit Collections at Brogdale", *Farm Advisory Services Team*". Retrieved 2 December 2012.

[40] [http://www.ecpgr.cgiar.org/index.php?id=2501&tx_wfqbe_pi1{[}uid{]}=59 "ECPGR Malus/Pyrus Working Group Members"]. Ecpgr.cgiar.org. 22 July 2002. Retrieved 25 August 2014.

[41] Sue Tarjan (Fall 2006). "Autumn Apple Musings" (PDF). News & Notes of the UCSC Farm & Garden, Center for Agroecology & Sustainable Food Systems. pp. 1–2. Archived from the original (PDF) on 11 August 2007. Retrieved 24 January 2008.

[42] "World apple situation". Archived from the original on 11 February 2008. Retrieved 24 January 2008.

[43] Weaver, Sue (June–July 2003). "Crops & Gardening – Apples of Antiquity". *Hobby Farms magazine* (BowTie, Inc).

[44] John Lloyd and John Mitchinson (2006). *QI: The Complete First Series – QI Factoids* (DVD). 2 entertain.

[45] "NCSU.edu". Ces.ncsu.edu. 24 July 2009. Retrieved 7 November 2010.

[46] William G. Lord and Amy Ouellette (February 2010). "Dwarf Rootstocks for Apple Trees in the Home Garden" (PDF). University of New Hampshire. Retrieved 1 September 2013.

[47] Esmaeil Fallahi, W. Michael Colt, Bahar Fallahi, Ik-Jo Chun (January–March 2002). "The Importance of Apple Rootstocks on Tree Growth, Yield, Fruit Quality, Leaf Nutrition, and Photosynthesis with an Emphasis on 'Fuji'" (PDF). *Hort Technology* **12** (1).

[48] ML Parker (September 1993). "Apple Rootstocks and Tree Spacing". North Carolina Cooperative Extension Service. Retrieved 1 September 2013.

[49] Ferree, David Curtis; Ian J. Warrington (1999). *Apples: Botany, Production and Uses*. CABI Publishing. ISBN 0-85199-357-5. OCLC 182530169.

[50] Bob Polomski; Greg Reighard. "Apple". Clemson University. Archived from the original on 28 February 2008. Retrieved 22 January 2008.

[51] "Apples in Ecuador". Acta Hort. Retrieved 17 July 2008.

[52] S. Sansavini (1 July 1986). "The chilling requirement in apple and its role in regulating Time of flowering in spring in cold-Winter Climate" . *Symposium on Growth Regulators in Fruit Production* (International ed.). Acta Horticulturae. p. 179. ISBN 978-90-6605-182-9.

[53] "Controlled Atmosphere Storage (CA)". Washington State Apple Advertising Commission. Archived from the original on 11 March 2008. Retrieved 24 January 2008.

[54] "Food Science Australia Fact Sheet: Refrigerated storage of perishable foods" . Food Science Australia. February 2005. Retrieved 25 May 2007.

[55] Yepsen, Roger (1994). *Apples*. New York: W.W. Norton & Co. ISBN 0-393-03690-1.

[56] Lowther, Granville; William Worthington. *The Encyclopedia of Practical Horticulture: A Reference System of Commercial Horticulture, Covering the Practical and Scientific Phases of Horticulture, with Special Reference to Fruits and Vegetables*. The Encyclopedia of horticulture corporation.

[57] Coli, William et al. "Apple Pest Management Guide" . University of Massachusetts Amherst. Archived from the original on 12 February 2008. Retrieved 3 March 2008.

[58] Bradley, Fern Marshall; Ellis, Barbara W.; Martin, Deborah L., ed. (2009). *The Organic Gardener's Handbook of Natural Pest and Disease Control*. Rodale, Inc. pp. 32–34. ISBN 978-1-60529-677-7.

[59] "Production of Apple by countries" . UN Food & Agriculture Organization. 2011. Retrieved 19 December 2013.

[60] "FAO" . Faostat.fao.org. 8 August 2012. Retrieved 8 August 2012.

[61] Desmond, Andrew (1994). *The World Apple Market*. Haworth Press. pp. 144–149. ISBN 1-56022-041-4. OCLC 243470452.

[62] Kristin Churchill. "Chinese apple-juice concentrate exports to United States continue to rise". Great American Publishing. Archived from the original on 16 October 2006. Retrieved 22 January 2008.

[63] Gavin Evans (9 August 2005). "Fruit ban rankles New Zealand – Australian apple growers say risk of disease justifies barriers" . *International Herald Tribune*. Retrieved 9 August 2005.

[64] "Nutrition Facts, Apples, raw, with skin [Includes USDA commodity food A343]". Nutritiondata.com. Retrieved 3 January 2013.

[65] Boyer, Jeanelle; Liu, RH (May 2004). "Apple phytochemicals and their health benefits" . *Nutrition journal* (Cornell University, Ithaca, New York 14853-7201 USA: Department of Food Science and Institute of Comparative and Environmental Toxicology) **3** (1): 5. doi:10.1186/1475-2891-3-5. PMC 442131. PMID 15140261.

[66] Gerhauser, C (2008). "Cancer chemopreventive potential of apples, apple juice, and apple components" . *Planta Medica* **74** (13): 1608–24. doi:10.1055/s-0028-1088300. PMID 18855307.

[67] "Apples". Washington State Apple Advertising Commission. Archived from the original on 20 December 2007. Retrieved 22 January 2008.

[68] Yu, Xiuzhu; Van De Voort, Frederick R.; Li, Zhixi; Yue, Tianli (2007). "Proximate Composition of the Apple Seed and Characterization of Its Oil" . *International Journal of Food Engineering* **3** (5). doi:10.2202/1556-3758.1283.

[69] The Brown Apple. // The New York Times, 22 November 2010

[70] Ames, Guy (July 2001). "Considerations in organic apple production" (PDF). National Sustainable Agriculture Information Service. Retrieved 24 January 2008.

[71] "General Information – Apple" . Informall. Archived from the original on 23 July 2012. Retrieved 17 October 2011.

[72] Landau, Elizabeth, Oral allergy syndrome may explain mysterious reactions, 8 April 2009, *CNN Health*, accessed 17 October 2011

[73] Lewis S. Nelson; Richard D. Shih; Michael J. Balick (2007). *Handbook of poisonous and injurious plants*. Springer. pp. 211–212. ISBN 978-0-387-33817-0. Retrieved 13 April 2013.

[74] Pollan, Michael (2001). *The Botany of Desire: a Plant's-eye View of the World*. Random House. p. 22, cf. p. 9 & 50. ISBN 0375501290. Retrieved 3 January 2015.

This article incorporates text from a publication now in the public domain: Ward, Artemas (1911). *The Grocer's Encyclopedia*.

2.12 Further reading

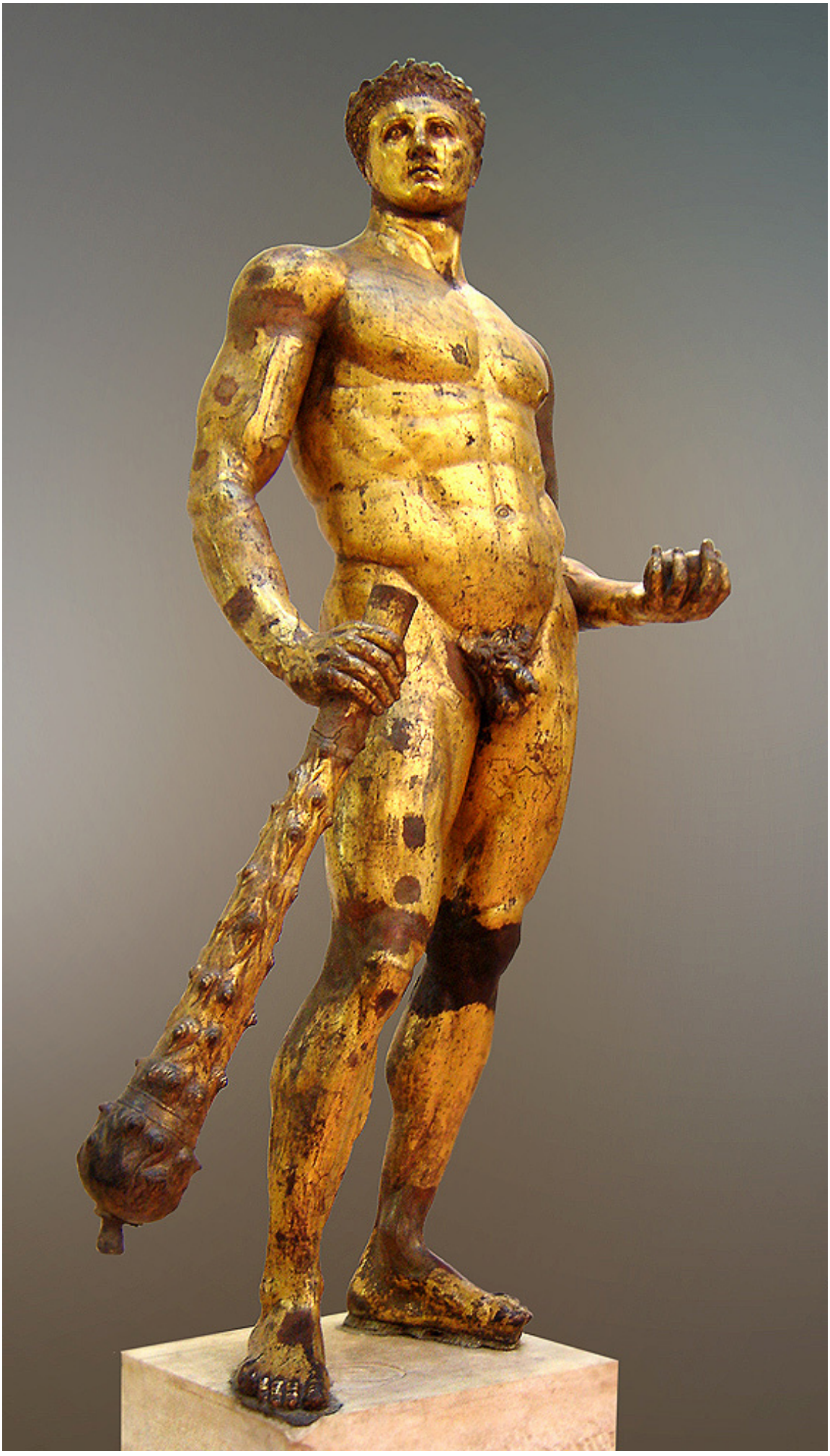
Books

- Browning, F. (1999). *Apples: The Story of the Fruit of Temptation*. North Point Press. ISBN 978-0-86547-579-3
- Mabberley, D.J. / Juniper, B.E. (2009). *The Story of the Apple*. Timber Press. ISBN 978-1-60469-172-6

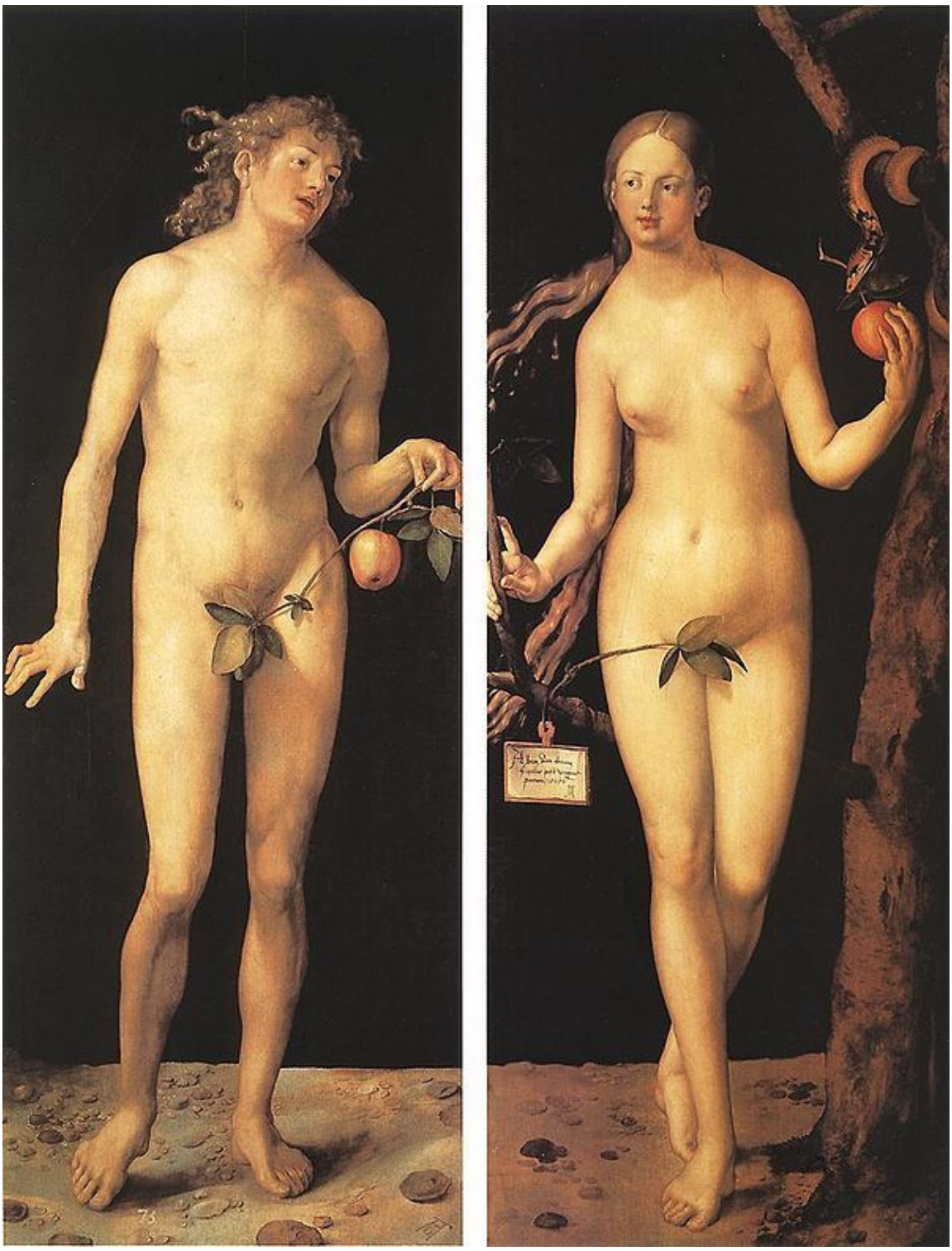
Review articles on possible health benefits

2.13 External links

- Apple Facts from the UK's Institute of Food Research
- National Fruit Collection (UK)
- Grand Valley State University digital collections- diary of Ohio fruit farmer Theodore Peticolas, 1863



Hercules with the apple of Hesperides



Adam and Eve *by Albrecht Dürer (1507), showcasing the apple as a symbol of sin.*

Red and green apples in India

An apple tree in Germany

Apple blossom from an old Ayrshire variety

Orchard mason bee on apple bloom, British Columbia, Canada

Leaves with significant insect damage

An apple core, the remainder of an apple that has been mostly eaten

Different kinds of apple cultivars in a wholesale food market

An apple's stem end, side, and interior

Chapter 3

Alnus glutinosa

Alnus glutinosa, the **common alder**, **black alder**, **European alder** or just **alder**, is a species of tree in the family Betulaceae, native to most of Europe, southwest Asia and northern Africa. It thrives in wet locations where its association with the bacterium *Frankia alni* enables it to grow in poor quality soils. It is a medium size, short-lived tree growing to a height of up to 30 metres (100 ft). It has short-stalked rounded leaves and separate male and female flower in the form of catkins. The small, rounded fruits are cone-like and the seeds are dispersed by wind and water.

The common alder provides food and shelter to wildlife, with a number of insects, lichens and fungi being completely dependent on the tree. It is a pioneer species, colonising vacant land and forming mixed forests as other trees appear in its wake. Eventually common alder dies out of woodlands because the seedlings need more light than is available on the forest floor. Its more usual habitat is forest edges, swamps and riverside corridors. The timber has been used in underwater foundations and for manufacture into paper and fibreboard, for smoking foods, for joinery, turnery and carving. Products of the tree have been used in ethnobotany, providing folk remedies for various ailments, and research has shown that extracts of the seeds are active against pathogenic bacteria.

3.1 Description

Alnus glutinosa is a tree that thrives in moist soils, and grows under favourable circumstances to a height of 20 to 30 metres (66 to 98 ft) and exceptionally up to 37 metres (121 ft).*[4] Young trees have an upright habit of growth with a main axial stem but older trees develop an arched crown with crooked branches. The base of the trunk produces adventitious roots which grow down to the soil and may appear to be propping the trunk up. The bark of young trees is smooth, glossy and greenish-brown while in older trees it is dark grey and fissured. The branches are smooth and somewhat sticky, being scattered with resinous warts. The buds are purplish-brown and have short stalks. Both male and female catkins form in the autumn and remain dormant during the winter.*[5]

The leaves of the common alder are short-stalked, rounded, up to 10 cm (4 in) long with a slightly wedge-shaped base and a wavy, serrated margin. They have a glossy dark green upper surface and paler green underside with rusty-brown hairs in the angles of the veins. As with some other trees growing near water, the common alder keeps its leaves longer than do trees in drier situations, and the leaves remain green late into the autumn. As the Latin name *glutinosa* implies, the buds and young leaves are sticky with a resinous gum.*[5]*[6]*[7]

The species is monoecious and the flowers are wind-pollinated; the slender cylindrical male catkins are pendulous, reddish in colour and 5 to 10 cm (2 to 4 in) long; the female flowers are upright, broad and green, with short stalks. During the autumn they become dark brown to black in colour, hard, somewhat woody, and superficially similar to small conifer cones. They last through the winter and the small winged seeds are mostly scattered the following spring. The seeds are flattened reddish-brown nuts edged with webbing filled with pockets of air. This enables them to float for about a month which allows the seed to disperse widely.*[5]*[6]*[7]

Unlike some other species of tree, common alders do not produce shade leaves. The respiration rate of shaded foliage is the same as well-lit leaves but the rate of assimilation is lower. This means that as a tree in woodland grows taller, the lower branches die and soon decay, leaving a small crown and unbranched trunk.*[8]

Foliage

3.2 Taxonomy

Alnus glutinosa was first described by Carl Linnaeus in 1753, as one of two varieties of alder (the other being *A. incana*), which he regarded as a single species *Betula alnus*.*[9] In 1785, Jean-Baptiste Lamarck treated it as a full species under the name *Betula glutinosa*.*[10] Its present scientific name is due to Joseph Gaertner, who in 1791 accepted the separation of alders from birches, and transferred the species to *Alnus*.*[2] The epithet *glutinosa* means "sticky" , referring particularly to the young shoots.*[11]

Within the genus *Alnus*, the common alder is placed in subgenus *Alnus* as part of a closely related group of species including the grey alder, *Alnus incana*,*[12] with which it hybridizes to form the hybrid *A.* × *hybrida*.*[13]

3.3 Distribution and habitat

The common alder is native to almost the whole of continental Europe (except for both the extreme north and south) as well as the United Kingdom and Ireland. In Asia its range includes Turkey, Iran and Kazakhstan, and in Africa it is found in Tunisia, Algeria and Morocco. It is naturalised in the Azores.*[14] It has been introduced, either by accident or by intent, to Canada, the United States, Chile, South Africa, Australia and New Zealand. Its natural habitat is in moist ground near rivers, ponds and lakes but it can also grow in drier locations and sometimes occurs in mixed woodland and on forest edges. It tolerates a range of soil types and grows best at a pH of between 5.5 and 7.2. Because of its association with the nitrogen-fixing bacterium *Frankia alni*, it can grow in nutrient-poor soils where few other trees thrive.*[15]

Male inflorescence (left) and mature cones (right)

3.4 Ecological relationships

The common alder is most noted for its symbiotic relationship with the bacterium *Frankia alni*, which forms nodules on the tree's roots. This nitrogen-fixing bacterium absorbs nitrogen from the air and fixes it in a form available to the tree. In return, the bacterium receives carbon products produced by the tree through photosynthesis. This relationship, which improves the fertility of the soil, has established the common alder as an important pioneer species in ecological succession.*[16]

The common alder is susceptible to *Phytophthora alni*, a recently evolved species of oomycete plant pathogen probably of hybrid origin. This is the causal agent of phytophthora disease of alder which is causing extensive mortality of the trees in some parts of Europe.*[17] The symptoms of this infection include the death of roots and of patches of bark, dark spots near the base of the trunk, yellowing of leaves and in subsequent years, the death of branches and sometimes the whole tree.*[15] *Taphrina alni* is a fungal plant pathogen that causes alder tongue gall, a chemically induced distortion of female catkins. The gall develops on the maturing fruits and produces spores which are carried by the wind to other trees. This gall is believed to be harmless to the tree.*[18] Another, also harmless, gall is caused by a midge, *Eriophyes inangulis*, which sucks sap from the leaves forming pustules.*[19]

The common alder is important to wildlife all year round and the seeds are a useful winter food for birds. Deer, sheep, hares and rabbits feed on the tree and it provides shelter for livestock in winter.*[15] It shades the water of rivers and streams, moderating the water temperature, and this benefits fish which also find safety among its exposed roots in times of flood. The common alder is the foodplant of the larvae of a number of different butterflies and moths*[20] and is associated with over 140 species of plant-eating insect.*[19] The tree is also a host to a variety of

mosses and lichens which particularly flourish in the humid moist environment of streamside trees. Some common lichens found growing on the trunk and branches include tree lungwort (*Lobaria pulmonaria*), *Menneguzzia terebrata* and *Stenocybe pullatula*, the last of which is restricted to alders.*[19] Some 47 species of mycorrhizal fungi have been found growing in symbiosis with the common alder, both partners benefiting from an exchange of nutrients. As well as several species of *Naucoria*, these symbionts include *Russula alnetorum*, the milkcaps *Lactarius obscuratus* and *Lactarius cyathula*, and the alder roll-rim *Paxillus filamentosus*, all of which grow nowhere else except in association with alders. In spring, the catkin cup *Ciboria amentacea* grows on fallen alder catkins.*[19]

As an introduced species, the common alder can affect the ecology of its new locality. It is a fast-growing tree and can quickly form dense woods where little light reaches the ground, and this may inhibit the growth of native plants. The presence of the nitrogen-fixing bacteria and the annual accumulation of leaf litter from the trees also alters the nutrient status of the soil. It also increases the availability of phosphorus in the ground, and the tree's dense network of roots can cause increased sedimentation in pools and waterways. It spreads easily by wind-borne seed, may be dispersed to a certain extent by birds and the woody fruits can float away from the parent tree. When the tree is felled, regrowth occurs from the stump, and logs and fallen branches can take root.*[15] *A. glutinosa* is classed as an environmental weed in New Zealand.*[21]

3.5 Cultivation and uses

The common alder is used as a pioneer species and to stabilise river banks, to assist in flood control, to purify water in waterlogged soils and to moderate the temperature and nutrient status of water bodies. It can be grown by itself or in mixed species plantations, and the nitrogen-rich leaves falling to the ground enrich the soil and increase the production of such trees as walnut, Douglas fir and poplar on poor quality soils. Although the tree can live for up to 160 years, it is best felled for timber at 60 to 70 years before heart rot sets in.*[8]

On marshy ground it is important as coppice-wood, being cut near the base to encourage the production of straight poles. It is capable of enduring clipping as well as marine climatic conditions and may be cultivated as a fast-growing windbreak. In woodland, the seedlings cannot tolerate dense shade and as the forest matures, the alder trees in it die out.*[22] The species is cultivated as a specimen tree in parks and gardens, and the cultivar 'Imperialis' has gained the Royal Horticultural Society's Award of Garden Merit.*[23]

3.5.1 Timber

The wood is soft, white when first cut, turning to pale red; the knots are attractively mottled. The timber is not used where strength is required in the construction industry, but is used for paper-making, the manufacture of fibreboard and the production of energy.*[8] Under water the wood is very durable and is used for deep foundations of buildings. The piles beneath the Rialto in Venice, and the foundations of several medieval cathedrals are made of alder. The Roman architect Vitruvius mentioned that the timber was used in the construction of the causeways across the Ravenna marshes.*[24] The wood is used in joinery, both as solid timber and as veneer, where its grain and colour are appreciated, and it takes dye well. As the wood is soft, flexible and somewhat light, it can be easily worked as well as split. It is valued in turnery and carving, in making furniture, window frames, clogs, toys, blocks, pencils and bowls.*[5]

3.5.2 Tanning and dyeing

The bark of the common alder has long been used in tanning and dyeing. The bark and twigs contain 16 to 20% tannic acid but their usefulness in tanning is limited by the strong accompanying colour they produce.*[25] Depending on the mordant and the methods used, various shades of brown, fawn, and yellowish-orange hues can be imparted to wool, cotton and silk. Alder bark can also used with iron sulphate to create a black dye which can substitute for the use of sumach or galls.*[26] The Laplanders are said to chew the bark and use their saliva to dye leather. The shoots of the common alder produce a yellowish or cinnamon-coloured dye if cut early in the year. Other parts of the tree are also used in dyeing; the catkins can yield a green colour and the fresh-cut wood a pinkish-fawn colour.*[25]

Infrutescence and Achenes

3.5.3 Other uses

It is also the traditional wood that is burnt to produce smoked fish and other smoked foods, though in some areas other woods are now more often used. It supplies high quality charcoal.*[5]

The leaves of this tree are sticky and if they are spread on the floor of a room, their adhesive surface is said to trap fleas.*[25]

Chemical constituents of *Alnus glutinosa* include hirsutanonol, oregonin, genkwanin,*[27] rhododendrin {3-(4-hydroxyphenyl)-l-methylpropyl-β-D-glucopyranoside} and glutinic acid (2,3-pentadienedioic acid).*[28]

3.6 Health

Pollen from the common alder, along with that from birch and hazel, is one of the main sources of tree pollen allergy. As the pollen is often present in the atmosphere at the same time as that of birch, hazel, hornbeam and oak, and they have similar physicochemical properties, it is difficult to separate out their individual effects. In central Europe, these

tree pollens are the second most common cause of allergic conditions after grass pollen.*[29]

The bark of common alder has traditionally been used as an astringent, a cathartic, a hemostatic, a febrifuge, a tonic and an alterative (a substance able to restore normal health). A decoction of the bark has been used to treat swelling, inflammation and rheumatism, as an emetic, and to treat pharyngitis and sore throat.*[28] Ground up bark has been used as an ingredient in toothpaste, and the inner bark can be boiled in vinegar to provide a skin wash for treating dermatitis, lice and scabies. The leaves have been used to reduce breast discomfort in nursing mothers and folk remedies advocate the use of the leaves against various forms of cancer.*[22] Alpine farmers are said to use the leaves to alleviate rheumatism by placing a heated bag full of leaves on the affected areas. Alder leaves are consumed by cows, sheep, goats and horses though pigs refuse to eat them. According to some people, consumption of alder leaves causes blackening of the tongue and is harmful to horses.*[25]

In a research study, extracts from the seeds of the common alder have been found to be active against all the eight pathogenic bacteria against which they were tested, which included *Escherichia coli* and methicillin-resistant *Staphylococcus aureus*. The only extract to have significant antioxidant activity was that extracted in methanol. All extracts were of low toxicity to brine shrimps. These results suggest that the seeds could be further investigated for use in the development of possible anti-MRSA drugs.*[30]

3.7 Details of Alder structure and galls

- Details
- Alder carr in Germany
- Trees in winter, Germany
- Buds
- Bark
- Alder Tongue Gall fungus, *Taphrina alni*
- Detail - Alder Tongue Gall
- Black alder in Ås, Norway
- Black alder defies harsh conditions in the Swedish archipelago

3.8 References

[1] Participants of the FFI/IUCN SSC Central Asian regional tree Red Listing workshop, Bishkek, Kyrgyzstan (11–13 July 2006) (2007). "*Alnus glutinosa*". *IUCN Red List of Threatened Species. Version 2014.2*. International Union for Conservation of Nature. Retrieved 8 October 2014.

[2] "*Alnus glutinosa*". *The International Plant Names Index*. Retrieved 2014-08-31.

[3] "*Alnus glutinosa*". *World Checklist of Selected Plant Families*. Royal Botanic Gardens, Kew. Retrieved 2014-08-31.

[4] "Spitzenbäume" . Land Brandenburg. Retrieved 2009-01-19.

[5] Vedel, Helge; Lange, Johan (1960). *Trees and Bushes*. Methuen. pp. 143–145. ISBN 978-0-416-61780-1.

[6] Trees for Life Species Profile: *Alnus glutinosa*

[7] Flora of NW Europe: *Alnus glutinosa*

[8] Claessens, Hugues; Oosterbaan, Anne; Savill, Peter; Rondeux, Jacques (2010). "A review of the characteristics of black alder (*Alnus glutinosa* (L.) Gaertn.) and their implications for silvicultural practices" . *Forestry* **83** (2): 163–175. doi:10.1093/forestry/cpp038.

[9] "*Betula alnus* var. *glutinosa*". *The International Plant Names Index*. Retrieved 2014-08-31.

[10] "*Betula glutinosa*". *The International Plant Names Index*. Retrieved 2014-08-31.

[11] Coombes, Allen J. (1994). *Dictionary of Plant Names*. London: Hamlyn Books. p. 8. ISBN 978-0-600-58187-1.

[12] Chen, Zhiduan & Li, Jianhua (2004). "Phylogenetics and Biogeography of *Alnus* (Betulaceae) Inferred from Sequences of Nuclear Ribosomal DNA ITS Region". *International Journal of Plant Sciences* **165**: 325–335. doi:10.1086/382795.

[13] Stace, Clive (2010). *New Flora of the British Isles* (3rd ed.). Cambridge, UK: Cambridge University Press. p. 296. ISBN 978-0-521-70772-5.

[14] "*Alnus glutinosa*". *Flora Europaea*. Royal Botanic Garden Edinburgh. Retrieved 2014-08-09.

[15] "*Alnus glutinosa* (tree)". *Global Invasive Species Database*. IUCN SSC Invasive Species Specialist Group. 2010-08-27. Retrieved 2014-08-04.

[16] Schwencke, J.; Caru, M. (2001). "Advances in actinorhizal symbiosis: Host plant-*Frankia* interactions, biology, and application in arid land reclamation: A review". *Arid Land Research and Management* **15** (4): 285–327. doi:10.1080/153249801753127615.

[17] Phytophthora Disease of Alder

[18] Ellis, Hewett A. (2001). *Cecidology*. Vol.16, No.1. p. 24.

[19] Featherstone, Alan Watson (2012-11-26). "Common or black alder". Trees for life. Retrieved 2014-08-07.

[20] Carter, David James; Hargreaves, Brian (1986). *A field guide to caterpillars of butterflies and moths in Britain and Europe*. Collins. ISBN 978-0-00-219080-0.

[21] Clayson, Howell (May 2008). *Consolidated list of environmental weeds in New Zealand*. Wellington: Department of Conservation. ISBN 978-0-478-14412-3.

[22] "*Alnus glutinosa* - (L.)Gaertn.". Plants For A Future. 2012. Retrieved 2014-08-05.

[23] "*Alnus glutinosa* Imperialis". Royal Horticultural Society. Retrieved 2014-08-06.

[24] Paterson, J. M. "The Alder Tree". *A Tree in Your Pocket*. Retrieved 2014-08-03.

[25] Grieve, M. "Alder, Common". *Botanical.com: A Modern Herbal*. Retrieved 2014-08-05.

[26] Adrosko, Rita J. (2012). *Natural Dyes and Home Dyeing*. Courier Dover Publications. pp. 41–42. ISBN 978-0-486-15609-5.

[27] O'Rourke, Ciara; Sarker, Satyajit D.; Stewart, Fiona; Byres, Maureen; Delazar, Abbas; Kumarasamy, Yashodharan; Nahar, Lutfun. "Hirsutanonol, oregonin and genkwanin from the seeds of *Alnus glutinosa* (Betulaceae)". *Biochemical Systematics and Ecology* **33** (7): 749–752. doi:10.1016/j.bse.2004.10.005. ISSN 0305-1978.

[28] Sati, Sushil Chandra; Sati, Nitin; Sati, O. P. (2011). "Bioactive constituents and medicinal importance of genus *Alnus*". *Pharmacognosy Review* **5** (10): 174–183. doi:10.4103/0973-7847.91115. PMC 3263052. PMID 22279375.

[29] "Erle: Schwarzerle, *Alnus glutinosa*". *Alles zur Allergologie* (in German). Retrieved 2014-08-05.

[30] Middleton, P.; Stewart, F.; Al-Qahtani, S.; Egan, P.; O'Rourke, C.; Abdulrahman, A.; Byres, M.; Middleton, M.; Kumarasamy, Y.; Shoeb, M.; Nahar, L.; Delazar, A.; Sarker, S. D. (2005). "Antioxidant, Antibacterial Activities and General Toxicity of *Alnus glutinosa*, *Fraxinus excelsior* and *Papaver rhoeas*". *Iranian Journal of Pharmaceutical Research* **4** (2): 101–103.

Chapter 4

Malus sylvestris

Malus sylvestris, the **European crab apple**, is a species of the genus *Malus*, native to Europe. Its scientific name means "forest apple", and the truly wild tree has thorns.

4.1 Progenitor of cultivated apples

In the past, *M. sylvestris* was thought to be the most important ancestor of the cultivated apple (*M. domestica*), which has since been shown to have been originally derived from the central Asian species *M. sieversii*.*[1] However, another recent DNA analysis*[2] confirms that *M. sylvestris* has contributed significantly to the genome.

The study found that secondary introgression from other species of the *Malus* genus has greatly shaped the genome of *M. domestica*, with *M. sylvestris* being the largest secondary contributor. It also found that current populations of *M. domestica* are more closely related to *M. sylvestris* than to *M. sieversii*. However in more pure strains of *M. domestica* the *M. sieversii* ancestry still predominates.

4.2 Description

The flowers are hermaphrodite and are pollinated by insects.

4.3 Pests

Its leaves are food of the caterpillars of the Twin-spotted Sphinx (*Smerinthus jamaicensis*) and possibly the Hawthorn Moth (*Scythropia crataegella*).

4.4 Gallery

- Tree
- Blossoms at the Botanical Garden KIT, Karlsruhe, Germany
- At Vosseslag, Belgium
- Pink blossom
- Ripe Wild Crab Apples (Malus sylvestris)
- Close-up showing fruit and leaves (Southeast Michigan)
- Fruit

4.5 See also

- List of Lepidoptera that feed on *Malus*

4.6 Notes

[1] Velasco R., Zharkikh A., Affourtit J. et al., The genome of the domesticated apple (*Malus* × *domestica* Borkh.) *Nature Genetics*, 2010, 42, 10, 833

[2] Coart, E., Van Glabeke, S., De Loose, M., Larsen, A.S., Roldán-Ruiz, I. 2006. Chloroplast diversity in the genus *Malus*: new insights into the relationship between the European wild apple (*Malus sylvestris* (L.) Mill.) and the domesticated apple (*Malus domestica* Borkh.). *Mol. Ecol.* **15(8)**: 2171-82.

- M.H.A. Hoffman, List of names of woody plants, Applied Plant Research, Boskoop 2005.
- RHS dictionary of gardening, 1992

4.7 External links

- Jepson Manual Treatment
- USDA Plants Profile
- *Malus sylvestris* in Topwalks Plants of Spain
- Calphotos photo gallery

Chapter 5

Fraxinus

Fraxinus /ˈfræksɨnəs/*[4] is a genus of flowering plants in the olive and lilac family, Oleaceae. It contains 45–65 species of usually medium to large trees, mostly deciduous though a few subtropical species are evergreen. The genus is widespread across much of Europe, Asia and North America.*[3]*[5]*[6]*[7]*[8]

The tree's common English name, "ash", goes back to the Old English *æsc*, while the generic name originated in Latin. Both words also mean "spear" in their respective languages.*[9] The leaves are opposite (rarely in whorls of three), and mostly pinnately compound, simple in a few species. The seeds, popularly known as "keys" or "helicopter seeds", are a type of fruit known as a samara. Most *Fraxinus* species are dioecious, having male and female flowers on separate plants;*[10] if grown as an ornamental and both sexes are present, ashes can cause a considerable litter problem with their seeds. Rowans or mountain ashes have leaves and buds superficially similar to those of true ashes but belong to the unrelated genus *Sorbus* in the rose family.

5.1 Selected species

Species are organized according to phylogenetic analysis.*[11]*[12]

Section *Dipetalae*

- *Fraxinus dipetala* Hook. & Arn. – California ash or two-petal ash
- *Fraxinus anomala* Torr. ex S.Watson – singleleaf ash
- *Fraxinus quadrangulata* Michx. – blue ash
- *Fraxinus lowellii* – Lowell ash
- *Fraxinus trifoliata*

Section *Melioides* sensu lato

- *Fraxinus chiisanensis*
- *Fraxinus cuspidata* Torr. – fragrant ash
- *Fraxinus platypoda*
- *Fraxinus spaethiana* Lingelsh. – Späth's ash

Section *Melioides* sensu stricto

- *Fraxinus uhdei* (Wenz.) Lingelsh. – Shamel ash or tropical ash
- *Fraxinus latifolia* Benth. – Oregon ash

European Ash in flower

- *Fraxinus papillosa* Lingelsh. – Chihuahua ash
- *Fraxinus americana* L. – white ash
- *Fraxinus profunda* (Bush) Bush – pumpkin ash
- *Fraxinus pennsylvanica* Marshall green ash
- *Fraxinus velutina* Torr. – velvet ash or Arizona ash

*Narrow-leafed Ash (*Fraxinus angustifolia*) shoot with leaves*

- *Fraxinus berlandieriana* DC. – Mexican ash

- *Fraxinus caroliniana* Mill. – Carolina ash
- *Fraxinus texensis* (A.Gray) Sarg. – Texas ash

Section *Pauciflorae*

- *Fraxinus greggii* A.Gray – Gregg's ash
- *Fraxinus purpusii*
- *Fraxinus gooddingii* – Goodding's ash
- *Fraxinus rufescens*
- *Fraxinus dubia*

Section *Sciadanuthus*

- *Fraxinus hubeiensis* Ch'u & Shang & Su – 湖北梣 hu bei qin
- *Fraxinus xanthoxyloides* (G.Don) Wall. ex DC. – Afghan Ash*[13]*[14]
- *Fraxinus dimorpha*

Section *Faxinus*

- *Fraxinus nigra* Marshall – black ash
- *Fraxinus mandschurica* Rupr. – Manchurian ash
- *Fraxinus holotricha* Koehne
- *Fraxinus angustifolia* Vahl – narrow-leafed ash
  - *Fraxinus angustifolia* subsp. *oxycarpa* – Caucasian ash
    - Claret ash or raywood ash
  - *Fraxinus angustifolia* subsp. *syriaca*
- *Fraxinus excelsior* L. – European ash
- *Fraxinus pallisiae* Wilmott – Pallis' ash
- *Fraxinus sogdiana Bge*

Section *Ornus*

- *Fraxinus griffithii* C.B.Clarke – Griffith's ash
- *Fraxinus micrantha* Lingelsh.
- *Fraxinus chinensis* Roxb. – Chinese ash or Korean ash
- *Fraxinus japonica* – Japanese ash
- *Fraxinus longicuspis*
- *Fraxinus floribunda* Wall. – Himalayan manna ash
- *Fraxinus ornus* L. – manna ash or flowering ash
- *Fraxinus bungeana* DC. – Bunge's ash
- *Fraxinus paxiana* Lingelsh.

- *Fraxinus sieboldiana* Blume – Japanese flowering ash
- *Fraxinus lanuginosa*
- *Fraxinus malacophylla*
- *Fraxinus apertisquamifera*
- *Fraxinus baroniana*

- Closeup of European ash seeds
- *Fraxinus ornus*
- Unusual "treelets" growing from a fallen ash tree in Lawthorn wood, Ayrshire, Scotland

5.2 Ecology

Ash is used as a food plant by the larvae of some Lepidoptera species (butterflies and moths)—see list of Lepidoptera that feed on ashes.

5.3 Threats

The emerald ash borer (*Agrilus planipennis*) is a wood-boring beetle accidentally introduced to North America from eastern Asia via solid wood packing material in the late 1980s to early 1990s. It has killed tens of millions of trees in 15 states in the United States and adjacent Ontario in Canada. It threatens some seven billion ash trees in North America. Research is being conducted to determine if three native Asian wasps that are natural predators of EAB could be used as a biological control for the management of EAB populations in the United States. The public is being cautioned not to transport unfinished wood products, such as firewood, to slow the spread of this insect pest.*[15]

The European ash, *Fraxinus excelsior*, has been affected by the fungus *Hymenoscyphus pseudoalbidus*, causing ash dieback*[16] in a large number of trees since the mid-1990s, particularly in eastern and northern Europe.*[17]*[18] The disease has infected about 90% of Denmark's ash trees.*[19] At the end of October 2012 in the UK the Food and Environment Research Agency (Fera) reported that ash dieback had been discovered in mature woodland in Suffolk, previous occurrences had been on young trees imported from Europe.*[20]

5.4 Uses

Ash is a hardwood and is hard, dense (within 20% of 670 kg/m^3 for *Fraxinus americana*,*[21] and higher at 710 kg/m^3 for *Fraxinus excelsior**[22]), tough and very strong but elastic, extensively used for making bows, tool handles, baseball bats, hurleys and other uses demanding high strength and resilience.

It is also often used as material for electric guitar bodies and, less commonly, for acoustic guitar bodies, known for its bright, cutting tone and sustaining quality. Some Fender Stratocasters and Telecasters are made of ash, as an alternative to the darker sounding alder. They are also used for making drum shells. Interior joinery is another common use of both European and white ash. Ash veneers are extensively used in office furniture. Ash is not used much outdoors due to the heartwood having a low durability to ground contact,*[22] meaning it will typically perish within five years.

Woodworkers generally like the timber for its great finishing qualities. It also has good machining qualities, and is quite easy to use with nails, screws and glue.*[21] Ash was commonly used for the structural members of the bodies of cars made by carriage builders. Early cars had frames which were intended to flex as part of the suspension system in order to simplify construction. The Morgan Motor Company of Great Britain still manufacture sports cars with frames made from ash. It was also widely used by early aviation pioneers for aircraft construction.

It lights and burns easily, so is used for starting fires and barbecues, and is usable for maintaining a fire, though it produces only a moderate heat. The two most economically important species for wood production are white ash, in

Canker on an ash tree in North Ayrshire, Scotland

eastern North America, and European ash in Europe. The green ash (*F. pennsylvanica*) is widely planted as a street tree in the United States. The inner bark of the blue ash (*F. quadrangulata*) has been used as a source for blue dye.

The leaves of ash are appreciated by cows, goats and rabbits. Cut off in the autumn the branches can be a valuable winter supply for domestic animals.

5.5 Mythology and folklore

In Greek mythology, the Meliae were nymphs of the ash, perhaps specifically of the manna ash (*Fraxinus ornus*), as dryads were nymphs of the oak. They appear in Hesiod's *Theogony.*

The ash exudes a sugary substance that, it has been suggested, was fermented to create the Norse Mead of Inspiration.*[23]

In Norse mythology was Yggdrasill often seen as a giant ash tree. Many scholars now agree that in the past an error had been made in the interpretation of the ancient writings, and that the tree is most likely a European yew (Taxus baccata). This mistake would find its origin in an alternative word for the yew tree in the Old Norse, namely needle ash (*barraskr*).*[24] In addition, ancient sources, including the Eddas, write about a *vetgrønster vida* which means "evergreen tree". An ash sheds its leaves in the winter, while yew trees retain their needles. The first man, Ask, was formed from the "ash tree".

Elsewhere in Europe, snakes were said to be repelled by ash leaves or a circle drawn by an ash branch. Irish folklore claims that shadows from an ash tree would damage crops. In Cheshire, it was said that ash could be used to cure warts and rickets. In Sussex the ash and elm tree were known as the "widow makers" because the large boughs would often drop without warning.

5.6 See also

- List of Lepidoptera that feed on ashes
- Æ, the letter ash

5.7 References

[1] Franz Eugen Köhler, Köhler's Medizinal-Pflanzen

[2] "*Fraxinus* L.". *Germplasm Resources Information Network*. United States Department of Agriculture. 2006-04-03. Retrieved 2010-02-22.

[3] Kew World Checklist of Selected Plant Families

[4] *Sunset Western Garden Book,* 1995:606–607

[5] Altervista Flora Italiana, Frassino, *Fraxinus*

[6] Flora of China v 15 p 273, 衿属 qin shu, *Fraxinus* Linnaeus, Sp. Pl. 2: 1057. 1753.

[7] Philips, Roger (1979). *Trees of North America and Europe: A Guide to Field Identification, Revised and Updated*. New York: Random House. ISBN 0-394-50259-0. OCLC 4036251.

[8] US Department of Agriculture Plants Profile, genus *Fraxinus*

[9] J. P. Mallory, Douglas Q. Adams, ed. (1997). *Encyclopedia of Indo-European culture*. Taylor & Francis. p. 32. ISBN 978-1-884964-98-5.

[10] "Monoecious and dioecious plants". saylorplants.com. Retrieved 15 April 2013.

[11] http://www.oleaceae.info/publications/Wallander2008.pdf

[12] http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0080431#references

[13] "Species Records of *Fraxinus*". *Germplasm Resources Information Network*. United States Department of Agriculture. Retrieved 2010-02-22.

[14] "*Fraxinus* L.". *ITIS Standard Reports*. Integrated Taxonomic Information System. Retrieved 2010-02-22.

[15] "The Problem". *Don't Move Firewood*. Retrieved 14 October 2011.

[16] Kowalski T (2006) Chalara fraxinea sp. nov. associated with dieback of ash (Fraxinus excelsior) in Poland. Forest Pathology 36(4), 264-270

[17] E. Halmschlager & T. Kirisits (2008). "First report of the ash dieback pathogen Chalara fraxinea on Fraxinus excelsior in Austria". University of Natural Resources and Applied Life Sciences. Retrieved 10 February 2010.

[18] N. Ogris, T. Hauptman & D. Jurc (2009). "Chalara fraxinea causing common ash dieback newly reported in Slovenia". Slovenian Forestry Institute. Retrieved 10 February 2010.

[19] "'Ash dieback' fungus Chalara fraxinea in UK countryside". BBC. 25 October 2012. Retrieved 25 October 2012.

[20] BBC News 'Ash dieback' fungus, *Chalara fraxinea* found in UK countryside. retrieved 25 Oct. 2012

[21] "White Ash". Niche Timbers. Retrieved 2010-02-22.

[22] "Ash". Niche Timbers. Retrieved 2010-02-22.

[23] Dumont, Darl J. (Summer 1992). "The Ash Tree In Indo-European Culture". *Mankind Quarterly* **32** (4): 323–336.

[24] Faulkes, Anthony. Prologue and Gylfagining (2005)

5.8 External links

- Missouri Botanical Garden, gardening help, *Fraxinus americana*
- Cofrin Center for Biodiversity Herbarium, University of Wisconsin, Trees of Wisconsin, *Fraxinus* comparison chart
- Lady Bird Johnson Wildflower Center, University of Texas, *Fraxinus americana* L. White ash
- Plants for a Future, *Fraxinus excelsior* Ash, European ash, Common Ash

Chapter 6

Fraxinus excelsior

Fraxinus excelsior —known as the **ash**, or **European ash** or **common ash** to distinguish it from other types of ash — is a species of *Fraxinus* native to most of Europe from Portugal to Russia, with the exception of northern Scandinavia and southern Iberia. It is also considered native in southwestern Asia from northern Turkey east to the Caucasus and Alborz mountains. The northernmost location is in the Trondheimsfjord region of Norway.*[1]*[2] The species is widely cultivated and reportedly naturalized in New Zealand and in scattered locales in the United States and Canada (Nova Scotia, New Brunswick, Quebec, Massachusetts, Connecticut, New York, New Jersey, Maryland, Ontario, Ohio, Kentucky and British Columbia).*[3]*[4]*[5]

6.1 Description

It is a large deciduous tree growing to 20–35 m (66–115 ft) (exceptionally to 46 m or 151 ft) tall with a trunk up to 2 m (6.6 ft) (exceptionally to 3.5 m or 11 ft) diameter, with a tall, domed crown. The bark is smooth and pale grey on young trees, becoming thick and vertically fissured on old trees. The shoots are stout, greenish-grey, with jet black buds (which distinguish it from most other ash species, which have grey or brown buds). The leaves are 20–35 cm (7.9–13.8 in) long, pinnate compound, with 7-13 leaflets, the leaflets 3–12 cm (1.2–4.7 in) long and 0.8–3 cm (0.31–1.18 in) broad, sessile on the leaf rachis, and with a serrated margin. The leaves are often among the last to open in spring, and the first to fall in autumn if an early frost strikes; they have no marked autumn colour, often falling dull green. The flowers open before the leaves, the female flowers being somewhat longer than the male flowers; they are dark purple, and without petals, and are wind-pollinated. Both male and female flowers can occur on the same tree, but it is more common to find all male and all female trees; a tree that is all male one year can produce female flowers the next, and similarly a female tree can become male. The fruit is a samara 2.5–4.5 cm (0.98–1.77 in) long and 5–8 mm (0.20–0.31 in) broad, often hanging in bunches through the winter; they are often called 'ash keys'.*[1]*[6]*[7] If the fruit is gathered and planted when it is still green and not fully ripe, it will germinate straight away, however once the fruit is brown and fully ripe, it will not germinate until 18 months after sowing (i.e. not until two winters have passed).*[8]

European Ash rarely exceeds 250 years of age. However there are numerous specimens estimated between 200 and 250 years old and there are a few over 250. The largest is in Clapton Court, England and is 9 m (29.5 ft) in girth. There are several examples over 4.5 metres (14.8 ft) in Derbyshire alone.

6.2 Ecology

Ash occurs on a wide range of soil types, but is particularly associated with basic soils on calcareous substrates. The most northerly ashwood in Britain is on limestone at Rassal, Wester Ross, latitude 57.4278 N.

A number of Lepidoptera use the species as a food source. See Lepidoptera which feed on ashes. In the UK, many other invertebrates have also been found to feed on Ash.*[9]

Male flowers

6.3 Genome

The genome of *Fraxinus excelsior* is being sequenced by two groups of scientists in the United Kingdom. A group at Queen Mary University of London led by Richard Buggs are sequencing the self-pollinated offspring of a tree from Worcestershire, held by the Earth Trust.* [10] A group at the John Innes Centre and The Genome Analysis Centre led by Allan Downie are sequencing "Tree 35" from Denmark, discovered by Erik Kjær, which has survived 8 years

Seeds of fraxinus excelsior, *popularly known as "keys" or "helicopter seeds", are a type of fruit known as a samara*

of ash dieback.*[11]

6.4 Ash dieback

Ash dieback is caused by the fungus *Hymenoscyphus pseudoalbidus* which was previously known as *Chalara fraxinea*. Research into the genetics of the resistance of ash (*Fraxinus excelsior*) has shown that resistance does occur in European populations, but, at least for the samples tested, it is neither common nor strong.*[12]*[13]*[14]*[15]

6.5 Uses

Veneer of Common Ash Wood.

The resilience and rapid growth made it an important resource for smallholders and farmers. It was probably the most versatile wood in the countryside with wide-ranging uses. Until World War II the trees were often coppiced on a ten-year cycle to provide a sustainable source of timber for fuel and poles for building and woodworking.*[16] The colour of the wood ranges from creamy white to light brown, and the heart wood may be a darker olive-brown. Ash timber is hard, tough and very hard-wearing, with a coarse open grain and a density of 710 kg per cubic meter.*[17] It lacks oak's natural resistance to decay, and is not as suitable for posts buried in the ground. Because of its high flexibility, shock-resistance and resistance to splitting, ash wood is the traditional material for bows, tool handles, especially for hammers and axes, tennis rackets and snooker cue sticks and it was extensively used in the construction of early aircraft. Ash was commonly used green for making chair frames which would be seated with another timber or with woven rush (e.g. those made by Philip Clissett, see also *The English Regional Chair*[18]). The parts were turned on a pole lathe or shaped with a drawknife. The practice essentially died out in the early 20th century, but has seen a revival in recent years.

Ash is valuable as firewood because it burns well even when 'green' (freshly cut).*[19] Ash was coppiced, often in hedgerows, and evidence in the form of some huge boles with multiple trunks emerging at head height can still be

Replica of the body frame from the Volvo ÖV 4 car, made primarily from ash wood.

seen in parts of Britain. In Northumberland, crab and lobster pots (traps) sometimes known as 'creeves' by local people are still made from ash sticks. Because of its elasticity European Ash wood was commonly used for walking sticks. Poles were cut from a coppice and the ends heated in steam. The wood could then be bent in a curved vise to form the handle of the walking stick. The light colour and attractive grain of ash wood make it popular in modern furniture such as chairs, dining tables, doors and other architectural features and wood flooring.

Ash is the only wood used for the manufacture of hurleys, referred to as hurls in parts of Leinster and known as a camán in Irish, the timber sticks used in the game of hurling in Ireland. Hurleys are manufactured from the butt log (bottom 1.5-metre of the stem) and from trees ideally of a diameter at breast height of approximately 25-30 centimetres. Only fast grown, straight and knot free ash can be used for this purpose. Due to the lack of available ash in Ireland, over 75% of the timber needed to produce the 350,000 hurleys required for the game annually must be imported, mostly from eastern European countries.*[20] The importance of ash timber to the game of hurling is reflected in the fact that the game is referred to all over Ireland as "The Clash of the Ash".

6.6 Mythology

In the 13th century Edda and other writing relating to Norse mythology, a mythological ash tree called Yggdrasil serves as the center of the world. Though traditionally Yggdrasill was often seen as a giant ash tree, many scholars do now agree that in the past an error has been made in the interpretation of the ancient writings, and that the tree is most likely an European yew *(Taxus baccata)*. This mistake would find its origin in an alternative word for the yew tree in the Old Norse, namely Needle Ash (barraskr). In addition, ancient sources, including the Eddas, write about a *vetgrønster vida* which means "evergreen tree". An ash sheds its leaves in the winter, while yew trees retain their needles.

Yggdrasill's roots were anchored in the abyss of the underworld, and watered by the streams of wisdom and faith. Its trunk was supported by the earth, while its crown touched the arc of heaven.

6.7 Folklore

It is recorded that on the Isle of Bute in Scotland lovers used to eat leaves of an ash tree known at the "*Dreamin' Tree*" that grew near the church of St Blane and the pleasant dreams they then experienced revealed their actual spouses and intended fates.*[21]

6.8 Cultivars

Ash saplings from a mast year.

There are a number of cultivars including;

- *Fraxinus excelsior* 'Aurea', the traditional, slow-growing Golden Ash- not to be confused with 'Jaspidea'*[22]
- *Fraxinus excelsior* 'Aurea Pendula' (Weeping Golden Ash)
- *Fraxinus excelsior* 'Autumn Blaze'
- *Fraxinus excelsior* 'Autumn Purple'
- *Fraxinus excelsior* 'Crispa'
- *Fraxinus excelsior* 'Diversifolia' (One-leaved Ash)
- *Fraxinus excelsior* 'Erosa'
- *Fraxinus excelsior* 'Jaspidea' A modern, vigorous Golden Ash.
- *Fraxinus excelsior* 'Monophylla'
- *Fraxinus excelsior* 'Nana'
- *Fraxinus excelsior* 'Pendula' (Weeping Ash), one of the best known cultivars, widely planted during the Victorian era, it grows vigorously forming an attractive small to medium size tree with mounds of weeping branches.
- *Fraxinus excelsior* 'Skyline'.

6.9 Gallery

- Two ash trees fused together.
- Tree 46 m tall, Château des princes de Croÿ, Le Roeulx, Belgium.
- Old tree, Belgium.
- Leaf and shoot, showing black bud.
- Weeping Ash *Fraxinus excelsior* 'Pendula', Knightshayes Court, England.
- Buds.
- Bark

6.10 References

[1] Rushforth, K. (1999). *Trees of Britain and Europe*. Collins ISBN 0-00-220013-9.

[2] Den virtuella floran: *Fraxinus excelsior* distribution

[3] Kew World Checklist of Selected Plant Families, *Fraxinus excelsior*

[4] Biota of North America Program, *Fraxinus excelsior*

[5] Altervista Flora of the United States and Canada, *Fraxinus excelsior*

[6] Mitchell, A. F. (1974). *A Field Guide to the Trees of Britain and Northern Europe*. Collins ISBN 0-00-212035-6

[7] Mitchell, A. F. (1982). *The Trees of Britain and Northern Europe*. Collins ISBN 0-00-219037-0

[8] Forestry Commission/ Edlin, H. L. *Broadleaves*, HMSO, 1985, p36

[9] http://www.buglife.org.uk/Resources/Buglife/Invertebrates%20associated%20with%20Ash%20.pdf

[10] http://www.ashgenome.org

[11] http://www.bbc.co.uk/news/science-environment-22913111

[12] L.G. Stener (2012). "Clonal differences in susceptibility to the dieback of Fraxinus excelsior in southern Sweden". Scandinavian Journal of Forest Research. Retrieved 26 September 2012.

[13] E.D. Kjær et al. (2012). "Adaptive potential of ash (Fraxinus excelsior) populations against the novel emerging pathogen Hymenoscyphus pseudoalbidus". Evolutionary Applications. Retrieved 9 November 2012.

[14] L.V. McKinney et al. (2011). "Presence of natural genetic resistance in Fraxinus excelsior (Oleraceae) to Chalara fraxinea (Ascomycota): an emerging infectious disease". Heredity. Retrieved 9 November 2012.

[15] Pliūra, A.; Lygis, V.; Suchockas, V.; Bartkevičius, E. (2011). "Performance of twenty four European Fraxinus excelsior populations in three Lithuanian progeny trials with a special emphasis on resistance to Chlara fraxinea". *Baltic Forestry* **17** (1): 17–34.

[16] Mabey, R. (1996). *Flora Britannica*. Sinclair-Stevenson Ltd ISBN 1-85619-377-2.

[17] Ash. Niche Timbers. Accessed 19-08-2009.

[18] Cotton, Bernard D. (1990). *The English Regional Chair*. Woodbridge, Suffolk: Antiques Collectors Club. ISBN 1 85149 023 X.

[19] http://www.scoutbase.org.uk/library/hqdocs/facts/pdfs/fs315001.pdf

[20] Teagasc Report - Ash For Hurleys.

[21] Downie, R. Angus (1934). *Bute and the Cumbraes* Glasgow & London : BlacKwood & Son Ltd. Page 83

[22] http://www.kew.org/plants-fungi/Fraxinus-excelsior.htm

6.11 External links

Chapter 7

Birch

For other uses, see Birch (disambiguation).

Birch is a broadleaved deciduous hardwood tree of the genus ***Betula*** (/ˈbɛtjʊlə/),[*] [2] in the family Betulaceae, which also includes alders, hazels, and hornbeams, and is closely related to the beech/oak family, Fagaceae. The genus *Betula* contains 30 to 60 known taxa of which 11 are on the IUCN 2011 Red List of Threatened Species. They are typically rather short-lived pioneer species widespread in the Northern Hemisphere, particularly in northern temperate and boreal climates.[*] [3]

7.1 Etymology

The common name *birch* comes from Old English *birce*, *bierce*, from Proto-Germanic **berk-jōn* (cf. German *Birke*, West Frisian *bjirk*), an adjectival formation from **berkōn* (cf. Dutch *berk*, Low German *Bark*, Norwegian *bjørk*), itself from the Proto-Indo-European root **b^herHǵ- ~ b^hrHǵ-*, which also gave Lithuanian *béržas*, Russian *beréza*, Ukrainian *beréza*, Albanian *bredh* 'fir', Ossetian *bærz(æ)*, Sanskrit *bhurja*, Polish *brzoza*, Latin *fraxinus* 'ash (tree)'. This root is presumably derived from **b^hreh$_1$ǵ-* 'to shine', in reference to the birch's white bark. The Proto-Germanic rune *berkanan* is named after the birch.

The generic name *betula* is from Latin, which is a diminutive borrowed from Gaulish *betua* (cf. Old Irish *bethe*, Welsh *bedw*).

7.2 Description

Birch species are generally small to medium-sized trees or shrubs, mostly of temperate climates. The simple leaves are alternate, singly or doubly serrate, feather-veined, petiolate and stipulate. They often appear in pairs, but these pairs are really borne on spur-like, two-leaved, lateral branchlets.[*] [4] The fruit is a small samara, although the wings may be obscure in some species. They differ from the alders (*Alnus*, other genus in the family) in that the female catkins are not woody and disintegrate at maturity, falling apart to release the seeds, unlike the woody, cone-like female alder catkins.

The bark of all birches is characteristically marked with long, horizontal lenticels, and often separates into thin, papery plates, especially upon the paper birch. Its decided color gives the common names gray, white, black, silver and yellow birch to different species.

The buds form early and are full grown by midsummer, all are lateral, no terminal bud is formed; the branch is prolonged by the upper lateral bud. The wood of all the species is close-grained with satiny texture, and capable of taking a fine polish; its fuel value is fair.

7.2.1 Flower and fruit

The flowers are monoecious, opening with or before the leaves and borne once fully grown these leaves are usually 3–6 millimetres (0.12–0.24 in) long on three-flowered clusters in the axils of the scales of drooping or erect catkins or aments. Staminate aments are pendulous, clustered or solitary in the axils of the last leaves of the branch of the year or near the ends of the short lateral branchlets of the year. They form in early autumn and remain rigid during the winter. The scales of the staminate aments when mature are broadly ovate, rounded, yellow or orange color below the middle, dark chestnut brown at apex. Each scale bears two bractlets and three sterile flowers, each flower consisting of a sessile, membranaceous, usually two-lobed, calyx. Each calyx bears four short filaments with one-celled anthers or strictly, two filaments divided into two branches, each bearing a half-anther. Anther cells open longitudinally. The pistillate aments are erect or pendulous, solitary; terminal on the two-leaved lateral spur-like branchlets of the year. The pistillate scales are oblong-ovate, three-lobed, pale yellow green often tinged with red, becoming brown at maturity. These scales bear two or three fertile flowers, each flower consisting of a naked ovary. The ovary is compressed, two-celled, and crowned with two slender styles; the ovule is solitary.

7.3 Ecology

Birches often form even-aged stands on light, well-drained, particularly acidic soils. They are regarded as pioneer species, rapidly colonising open ground especially in secondary successional sequences following a disturbance or fire. Birches are early tree species to establish in primary successions, and can become a threat to heathland if the seedlings and saplings are not suppressed by grazing or periodic burning. Birches are generally lowland species, but some species, such as *Betula nana*, have a montane distribution. In the British Isles, there is some difference between the environments of *Betula pendula* and *Betula pubescens*, and some hybridization, though both are "opportunists in steady-state woodland systems". Mycorrhizal fungi, including sheathing (ecto)myccorhizas, are found in some cases to be beneficial to tree growth.*[5]

Birch foliage is used as a food plant by the larvae of a large number of lepidopteran (butterflies and moths) species.

7.4 Species

See also: Taxonomy of Betula

Birches native to Europe and Asia include

1. *Betula albosinensis*—Chinese red birch (northern + central China)
2. *Betula alnoides*—alder-leaf birch (China, Himalayas, northern Indochina)
3. *Betula ashburneri* (Bhutan, Tibet, Sichuan, Yunnan Provinces in China)
4. *Betula baschkirica* (eastern European Russia)
5. *Betula bomiensis* (Tibet)
6. *Betula calcicola* (Sichuan + Yunnan Provinces in China)
7. *Betula celtiberica* (Spain)
8. *Betula chichibuensis* (Chichibu region of Japan)
9. *Betula chinensis*—Chinese dwarf birch (China, Korea)
10. *Betula coriaceifolia* (Uzbekistan)
11. *Betula corylifolia* (Honshu Island in Japan)
12. *Betula costata* (northeastern China, Korea, Primorye region of Russia)
13. *Betula cylindrostachya* (Himalayas, southern China, Myanmar)

14. *Betula dahurica* (eastern Siberia, Russian Far East, northeastern China, Mongolia, Korea, Japan)
15. *Betula delavayi* - (Tibet, southern China)
16. *Betula ermanii*—Erman's birch (eastern Siberia, Russian Far East, northeastern China, Korea, Japan)
17. *Betula falcata* (Tajikistan)
18. *Betula fargesii* (Chongqing + Hubei Provinces in China)
19. *Betula fruticosa* (eastern Siberia, Russian Far East, northeastern China, Mongolia, Korea, Japan)
20. *Betula globispica* (Honshu Island in Japan)
21. *Betula gmelinii* (Siberia, Mongolia, northeastern China, Korea, Hokkaido Island in Japan)
22. *Betula grossa*—Japanese cherry birch (Japan)
23. *Betula gynoterminalis* (Yunnan Province in China)
24. *Betula honanensis* - (Henan Province in China)
25. *Betula humilis or* Betula kamtschatica—*Kamchatka birch* platyphylla *(northern + central Europe, Siberia, Kazakhstan, Xinjiana, Mongolia, Korea)*
26. *Betula insignis* - (southern China)
27. *Betula karagandensis* (Kazakhstan)
28. *Betula klokovii* (Ukraine)
29. *Betula kotulae* (Ukraine)
30. *Betula litvinovii* (Turkey, Iran, Caucasus)
31. *Betula luminifera* (China)
32. *Betula maximowiczii*—monarch birch (Japan, Kuril Islands)
33. *Betula medwediewii*—Caucasian birch (Turkey, Iran, Caucasus)
34. *Betula megrelica* (Republic of Georgia)
35. *Betula microphylla* (Siberia, Mongolia, Xinjiang, Kazakhstan, Kyrgyzstan, Uzbekistan)
36. *Betula nana*—dwarf birch (northern + central Europe, Russia, Siberia, Greenland, Northwest Territories of Canada))
37. *Betula pendula*—silver birch (widespread in Europe and northern Asia; Morocco; naturalized in New Zealand and scattered locations in US + Canada)
38. *Betula platyphylla* (*Betula pendula* var. *platyphylla*)—Siberian silver birch (Siberia, Russian Far East, Manchuria, Korea, Japan, Alaska, western Canada)
39. *Betula potamophila* (Tajikistan)
40. *Betula potaninii* (southern China)
41. *Betula psammophila* (Kazakhstan)
42. *Betula pubescens*—downy birch, also known as white, European white or hairy birch (Europe, Siberia, Greenland, Newfoundland; naturalized in scattered locations in US)
43. *Betula raddeana* (Caucasus)
44. *Betula saksarensis* (Khakassiya region of Siberia)
45. *Betula saviczii* (Kazakhstan)
46. *Betula schmidtii* (northeastern China, Korea, Japan, Primorye region of Russia)

47. *Betula sunanensis* (Gansu Province of China)
48. *Betula szechuanica* (*Betula pendula* var. *szechuanica*)—Sichuan birch (Tibet, southern China)
49. *Betula tianshanica* (Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan, Xinjiang, Mongolia)
50. *Betula utilis*—Himalayan birch (Afghanistan, Central Asia, China, China, Tibet, Himalayas)
51. *Betula wuyiensis* (Fujian Province of China)
52. *Betula zinserlingii* (Kyrgyzstan)

Note: many American texts have B. pendula *and* B. pubescens *confused, though they are distinct species with different chromosome numbers.*

Birches native to North America include

1. *Betula alleghaniensis*—yellow birch (*B. lutea*) (eastern Canada, Great Lakes, Northeastern US, Appalachians)
2. *Betula cordifolia*—mountain paper birch (eastern Canada, Great Lakes, Northeastern US)
3. *Betula glandulosa*—American dwarf birch (Siberia, Mongolia, Russian Far East, Alaska, Canada, Greenland, mountains of western US and New England, Aridondacks)
4. *Betula lenta*—sweet birch, cherry birch, or black birch (Quebec, Ontario, eastern US)
5. *Betula michauxii*—Newfoundland dwarf birch (Newfoundland, Labrador, Quebec, Nova Scotia)
6. *Betula minor*—dwarf white birch (eastern Canada, mountains of northern New England and Adirondacks)
7. *Betula nana*—dwarf birch or bog birch (also in northern Europe and Asia)
8. *Betula nigra*—river birch or black birch (eastern US)
9. *Betula occidentalis*—water birch or red birch (*B. fontinalis*) (Alaska, Yukon, Northwest Territories, western Canada, western US)
10. *Betula papyrifera*—paper birch, canoe birch or American white birch (Alaska, most of Canada, northern US)
11. *Betula populifolia*—gray birch (eastern Canada, northeastern US)
12. *Betula pumila*—swamp birch (Alaska, Canada, northern US)

7.5 Uses

Due to the hardness of Birch, it is better to shape it with power tools, as it is quite difficult to work it with hand tools.*[6]

- Birch wood is fine-grained and pale in colour, often with an attractive satin-like sheen. Ripple figuring may occur, increasing the value of the timber for veneer and furniture-making. The highly decorative Masur (or Karelian) birch, from *Betula verrucosa* var. *carelica*, has ripple textures combined with attractive dark streaks and lines. Birch wood is suitable for veneer, and birch plywood is among the strongest and most dimensionally stable plywoods, although it is unsuitable for exterior use.
- Birch plywood is made from laminations of birch veneer. It is light but strong, and has many other good properties. Birch plywood is used to make longboards (skateboard), giving it a strong yet flexible ride. It is also used (often in very thin grades with many laminations) for making model aircraft.
- Extracts of birch are used for flavoring or leather oil, and in cosmetics such as soap or shampoo. In the past, commercial oil of wintergreen (methyl salicylate) was made from the sweet birch (*Betula lenta*).
- Birch-tar or Russian oil extracted from birch bark is thermoplastic and waterproof; it was used as a glue on, for example, arrows, and also for medicinal purposes.*[7]

- Fragrant twigs of silver birch are used in saunas to relax the muscles.
- Birch is also associated with the feast of Pentecost in Germany, Central and Eastern Europe, and Russia, where its branches are used as decoration for churches and homes on this day.
- Birch leaves are used to make a diuretic tea and extracts for dyes and cosmetics.
- Ground birch bark, fermented in sea water, is used for seasoning the woolen, hemp or linen sails and hemp rope of traditional Norwegian boats.
- Birch twigs bound in a bundle, also called birch, were used for birching, a form of corporal punishment.
- Many of the indians of North America prized the birch for its bark, which due to its light weight, flexibility, and the ease with which it could be stripped from fallen trees, was often used for the construction of strong, waterproof but lightweight canoes, bowls, and wigwams.
- The Hughes H-4 Hercules was made mostly of birch wood, despite its better-known moniker, "The Spruce Goose".
- Birch plywood was specified by the BBC as the only wood that can be used in making the cabinets of the long-lived LS3/5A loudspeaker.*[8]
- Birch is used as firewood due to its high calorific value per unit weight and unit volume. It burns well, without popping, even when frozen and freshly hewn. The bark will burn very well even when wet because of the oils it contains. With care, it can be split into very thin sheets that will ignite from even the smallest of sparks.
- Birch sap is a traditional drink in Northern Europe, Russia, and Northern China. The sap is also bottled and sold commercially. Birch sap can be used to make birch syrup, which is used like maple syrup for pancakes and waffles. Birch wood can be used to smoke foods.
- Birch seeds are used as leaf litter in miniature terrain models.*[9]
- "Birch flowers" is the English marketing name for the catkins of the *Broussonetia luzonica* tree. Known in the Philippines as *himbabao* or *alukon*, these flowers are commonly used in the cuisine of northeastern Luzon. However, despite their English name and the similar appearance of their flowers, *B. luzonica* is not in any way related to the birch tree.*[10]
- Birch oil is used in the manufacture of Russia leather, a water-resistant leather.

7.5.1 Medical

- Birch bark is high in betulin and betulinic acid, phytochemicals which have potential as pharmaceuticals, and other chemicals which show promise as industrial lubricants.
- Birch buds are used in folk medicine.*[11]
- Birch bark can be soaked until moist in water, and then formed into a cast for a broken arm.*[12]
- The inner bark of birch can be ingested safely.
- In northern latitudes, birch is considered to be the most important allergenic tree pollen, with an estimated 15–20% of hay fever sufferers sensitive to birch pollen grains. The major allergen is a protein called Bet v I.

7.5.2 Paper

See also: Birch bark document

Wood pulp made from birch gives relatively long and slender fibres for a hardwood. The thin walls cause the fibre to collapse upon drying, giving a paper with low bulk and low opacity. The birch fibres are, however, easily fibrillated and give about 75% of the tensile strength of softwood.*[13] The low opacity makes it suitable for making glassine.

In India, the birch (Sanskrit: भुर्ज, *bhurja*) holds great historical significance in the culture of North India, where the thin bark coming off in winter was extensively used as writing paper. Birch paper (Sanskrit: भुर्ज पत्र, *bhurja patra*) is exceptionally durable and was the material used for many ancient Indian texts.*[14]*[15] The Roman period Vindolanda tablets also use birch as a material on which to write and birch bark was used widely in ancient Russia as note paper (*beresta*) and for decorative purposes and even making footwear.

7.5.3 Tonewood

Baltic birch is among the most sought-after wood in the manufacture of speaker cabinets. Birch has a natural resonance that peaks in the high and low frequencies, which are also the hardest for speakers to reproduce. This resonance compensates for the roll-off of low and high frequencies in the speakers, and evens the tone. Birch is known for having "natural EQ".

Drums are often made from birch. Prior to the 1970s, it was one of the most popular drum woods. Because of the need for greater volume and midrange clarity, drums were made almost entirely from maple until recently, when advances in live sound reinforcement and drum microphones have allowed the use of birch in high-volume situations. Birch drums have a natural boost in the high and low frequencies, which allows the drums to sound fuller.

Birch wood is sometimes used as a tonewood for semiacoustic and acoustic guitar bodies, and occasionally for solid-body guitar bodies. It is also a common material used in mallets for keyboard percussion.

7.6 Culture

Birches have spiritual importance in several religions, both modern and historical. In Celtic cultures, the birch symbolises growth, renewal, stability, initiation and adaptability because it is highly adaptive and able to sustain harsh conditions with casual indifference. Proof of this adaptability is seen in its easy and eager ability to repopulate areas damaged by forest fires or clearings. Birches are also associated with the *Tír na nÓg*, the land of the dead and the *Sidhe*, in Gaelic folklore, and as such frequently appear in Scottish, Irish, and English folksongs and ballads in association with death, or fairies, or returning from the grave. The leaves of the silver birch tree are used in the festival of St George, held in Novosej and other villages in Albania.*[16]

The birch is New Hampshire's state tree and the national tree of Finland and Russia. The Czech word for the month of March, Březen, is derived from the Czech word bříza meaning birch, as birch trees flower in March under local conditions. The silver birch tree is of special importance to the Swedish city of Umeå. In 1888, the Umeå city fire spread all over the city and nearly burnt it down to the ground, but some birches, supposedly, halted the spread of the fire. To protect the city against future fires, it was decided to plant silver birch trees all over the city. Umeå later adopted the unofficial name of "City of the Birches (*Björkarnas stad*)". Also, the ice hockey team of Umeå is called *Björklöven*, translated to English "The Birch Leaves".

"Swinging" birch trees was a common game for American children in the nineteenth century. American poet Lucy Larcom's "Swinging on a Birch Tree" celebrates the game.*[17] The poem inspired Robert Frost, who pays homage to the act of climbing birch trees his more famous poem, "Birches."*[18] Frost once told "it was almost sacrilegious climbing a birch tree till it bent, till it gave and swooped to the ground, but that's what boys did in those days".*[19]

7.7 See also

- Birch bark manuscript
- Birch beer
- Taxonomy of Betula

7.8 References

[1] http://apps.kew.org/wcsp/synonomy.do?name_id=21065

[2] *Sunset Western Garden Book,* 1995:606–607

[3] Ashburner, K. & McAllister, H.A. (2013). The genus *Betula*: a taxonomic revision of birches: 1-431. Royal Botanic Gardens, Kew.

[4] Keeler, Harriet L. (1900). *Our Native Trees and How to Identify Them*. New York: Charles Scriber's Sons. pp. 295–297.

[5] *Birches*. (A Symposium, Royal Botanic Garden, Edinburgh 24–26 September 1982. Proceedings of the Royal Society of Edinburgh, 85B, 1–11, 1984.

[6] "Birch". Wood Magazine. Retrieved December 1, 2013.

[7] "Birch Tar – How to collect it". Archived from the original on February 27, 2008.

[8] Prakel, David (August 1979). "BBC's Home Service", *Hi-Fi Answers*, pp67–9 (Courtesy link)

[9] Joyce, Daniel. "Birch Seed Leaves". reapermini.com.

[10] Grygus, Andrew. "Alokon". Clove Garden.

[11] White Birch – American Cancer Society (cancer.org)

[12] William Arthur Clark (January 1, 1937). "History of Fracture Treatment Up to the Sixteenth Century". *The Journal of Bone & Joint Surgery* (Needham, MA, USA: The Journal of Bone & Joint Surgery, Inc.) **19** (1): 61–62. Another method cited was that of splints made of birch bark soaked in water until quite soft. They were then carefully fitted to the limb and tied with bark thongs. On drying, they became stiff and firm. There is no record of the use of extension, but, nevertheless, very few crippled and deformed Indians were to be seen.

[13] Nanko, Hiroki; Button, Alan; Hillman, Dave (2005). *The World of Market Pulp*. USA: WOMP, LLC. pp. 192–195. ISBN 0-615-13013-5.

[14] Sanjukta Gupta, "Lakṣmī Tantra: A Pāñcarātra Text", Brill Archive, 1972, ISBN 90-04-03419-6. Snippet:... *the text recommends that the bark of the Himalayan birch tree (bhurja-patra) should be used for scribbling mantras ...*

[15] Amalananda Ghosh, "An Encyclopaedia of Indian Archaeology", BRILL, 1990, ISBN 90-04-09264-1. Snippet:... *Bhurja-patra, the inner bark on the birch tree grown in the Himalayan region, was a very common writing material ...*

[16] "Traditional celebrations in Novosej". RASP. Retrieved August 28, 2013.

[17] Pfileger, Pat. *Merry Coz* http://www.merrycoz.org/folks/BIRCH.HTM. Missing or empty |title= (help)

[18] Fagan, Deirdre J. (2007). *Critical Companion to Robert Frost: A Literary Reference to His Life and Work*. Infobase Publishing. p. 42. ISBN 9781438108544. Retrieved 10 November 2013.

[19] Parini, Jay (1999). *Robert Frost: A Life*. New York: Halt. p. 22.

7.9 Sources

- Flora of North America: *Betula*
- Flora of China: *Betula*
- Grimshaw, John (2009). *New Trees, Recent introductions to cultivation*. Kew Publishing, RBG Kew. pp. 163–174.
- Chisholm, Hugh, ed. (1911). "Birch". *Encyclopædia Britannica* **3** (11th ed.). Cambridge University Press.

7.10 External links

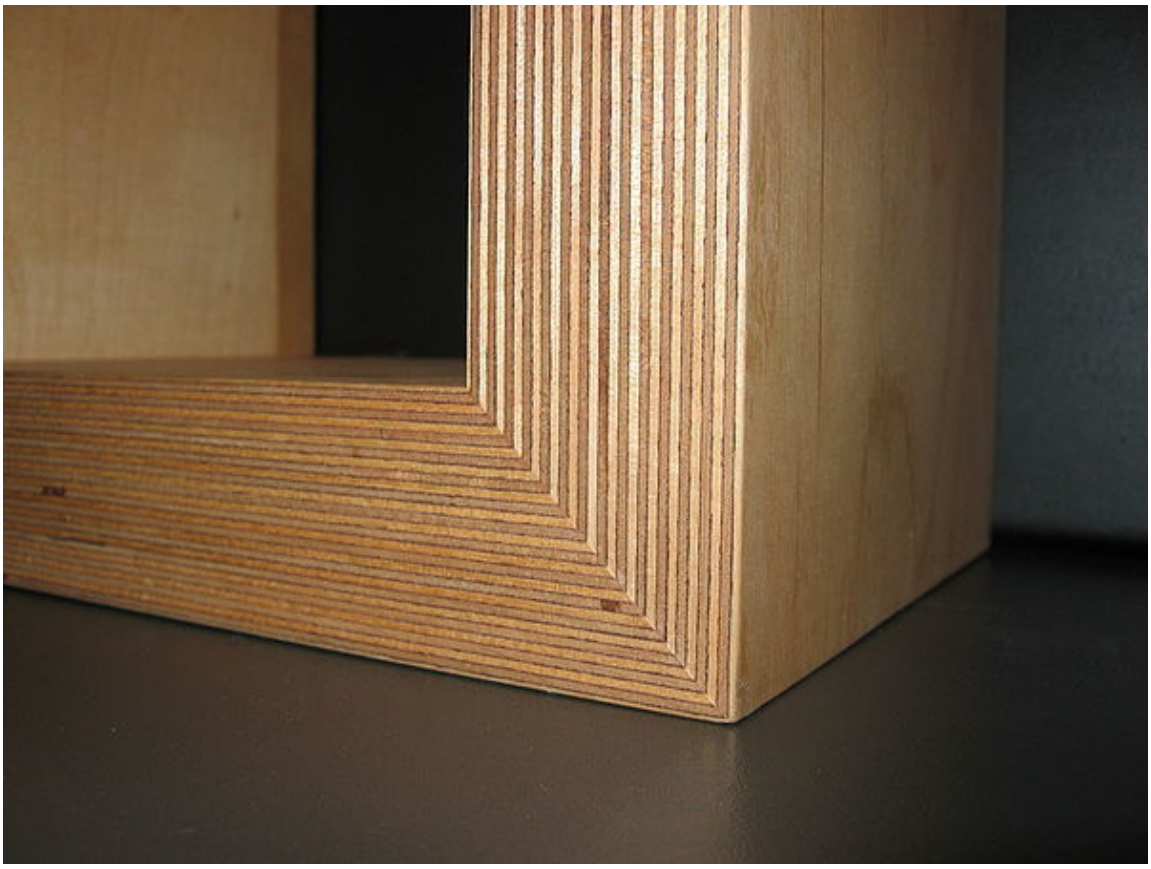
- Tree Family Betulaceae Diagnostic photos of many species, Morton Arboretum specimens
- Eichhorn, Markus (July 2010). "The Birch Tree". *Test Tube*. Brady Haran for the University of Nottingham.

Birch trees near stream in Hankasalmi, Finland

A stand of birch trees

Birch tree in autumn

Birch leaves



Birch plywood

Unfinished birch

Finished birch

A birch bark inscription excavated from Novgorod, circa 1240–1260

Chapter 8

Betula pendula

"Silver birch" redirects here. For the racehorse, see Silver Birch (horse).

Betula pendula, commonly known as **silver birch** or **warty birch**, is a species of tree in the family Betulaceae, native to Europe and parts of Asia, though in southern Europe it is only found at higher altitudes. Its range extends into Siberia, China and southwest Asia in the mountains of northern Turkey, the Caucasus and northern Iran. It has been introduced into North America, where it is known as the **European white birch**, and is considered invasive in some states in USA and in parts of Canada.

The silver birch is a medium-sized deciduous tree that owes its common name to the white peeling bark on the trunk. The twigs are slender and often pendulous and the leaves are roughly triangular with doubly serrate margins and turn yellow in autumn before they fall. The flowers are catkins and the light, winged seed get widely scattered by the wind. The silver birch is a hardy tree, a pioneer species, and one of the first trees to appear on bare or fire-swept land. Many species of birds and animals are found in birch woodland, the tree supports a wide range of insects and the light shade it casts allows shrubby and other plants to grow beneath its canopy. It is planted decoratively in parks and gardens and is used for forest products such as joinery timber, firewood, tanning, racecourse jumps and brooms. Various parts of the tree are used in traditional medicine and the bark contains triterpenes which have been shown to have medicinal properties.

8.1 Description

The silver birch is a medium-sized deciduous tree, typically reaching 15 to 25 m (49 to 82 ft) tall (exceptionally up to 31 metres (102 ft)),[*][1] with a slender trunk usually under 40 cm (16 in) diameter. The bark on the trunk and branches is golden-brown at first, but later this turns to white as a result of papery tissue developing on the surface and peeling off in flakes. The bark remains smooth until the tree gets quite large, but in older trees, the bark thickens, becoming irregular, dark and rugged. Young branches have whitish resin warts and the twigs are slender, hairless and often pendulous. The buds are small and sticky, and development is sympodial, that is to say the terminal bud dies away and growth continues from a lateral bud. Some shoots are long and bear the male catkins at the tip, while others are short and bear female catkins. The immature male catkins are present during the winter but the female catkins develop in the spring, soon after the leaves unfurl.[*][1]

The leaves have short slender stalks and are 3 to 7 cm (1.2 to 2.8 in) long, triangular with broad, untoothed, wedge-shaped bases, slender pointed tips and coarsely double-toothed, serrated margins. They are sticky with resin at first but this dries as they age leaving small white scales. The foliage is a pale to medium green and turns yellow early in the autumn before the leaves fall. In mid-summer, the female catkins mature and the male catkins expand and release pollen, and wind pollination takes place. The small 1 to 2 mm winged seeds ripen in late summer on pendulous, cylindrical catkins 2 to 4 cm (0.8 to 1.6 in) long and 7 mm (0.3 in) broad. The seeds are very numerous and are separated by scales, and when ripe, the whole catkin disintegrates and the seeds are spread widely by the wind.[*][1][*][2]

8.2 Distribution and habitat

The silver birch grows naturally from western Europe eastwards to Kazakhstan, the Sakha Republic in Siberia, Mongolia and the Xinjiang province in China, and southwards to the mountains of the Caucasus and northern Iran, Iraq and Turkey. It is also native to northern Morocco and has become naturalised in some other parts of the world.*[3] In the southern parts of its range it is mainly found in mountainous regions. Its light seeds are easily blown by the wind and it is a pioneer species, one of the first trees to sprout on bare land or after a forest fire. It needs plenty of light and does best on dry, acid soils and is found on heathland, mountainsides and clinging to crags.*[1] Its tolerance to pollution make it suitable for planting in industrial areas and exposed sites.*[4] It has been introduced into North America where it is known as the European white birch, and is considered invasive in the states of Kentucky, Maryland, Washington and Wisconsin.*[5] It is naturalised and locally invasive in parts of Canada.*[6]

8.3 Taxonomy

The closely related *Betula platyphylla* in northern Asia and *Betula szechuanica* of central Asia are also treated as varieties of silver birch by some botanists, as *B. pendula* var. *platyphylla* and *B. pendula* var. *szechuanica* respectively (see birch classification).*[7]

B. pendula is distinguished from the related downy birch (*B. pubescens*, the other common European birch) in having hairless, warty shoots (hairy and without warts in downy birch), more triangular leaves with double serration on the margins (more ovoid and with single serrations in downy birch), and whiter bark often with scattered black fissures (greyer, less fissured, in downy birch). It is also distinguished cytologically, silver birch being diploid (with two sets of chromosomes), whereas downy birch is tetraploid (four sets of chromosomes). Hybrids between the two are known, but are very rare, and being triploid, are sterile.*[8] The two have differences in habitat requirements, with silver birch found mainly on dry, sandy soils, and downy birch more common on wet, poorly drained sites such as clay soils and peat bogs. Silver birch also demands slightly more summer warmth than does downy birch, which is significant in the cooler parts of Europe. Many North American texts treat the two species as conspecific (and cause confusion by combining the downy birch's alternative vernacular name 'white birch', with the scientific name *B. pendula* of the other species), but they are regarded as distinct species throughout Europe.*[2]

Synonyms include *Betula pendula* var. *carelica* (Merckl.) Hämet-Ahti, *B. pendula* var. *laciniata* (Wahlenb.) Tidestr., *B. pendula* var. *lapponica* (Lindq.) Hämet-Ahti, *B. aetnensis* Raf., *B. montana* V.N.Vassil, *B. talassica* Poljakov, *B. verrucosa* Ehrh., *B. verrucosa* var. *lapponica* Lindq., and *B. fontqueri* Rothm.*[9]*[10] The rejected name *Betula alba* L. also applied in part to *B. pendula*, though also to *B. pubescens*.*[11]

8.4 Ecology

The silver birch has an open canopy which allows plenty of light to reach the ground. This allows a variety of mosses, grasses and flowering plants to grow beneath which in turn attract insects. Flowering plants often found in birch woods include primrose (*Primula vulgaris*), violet (*Viola riviniana*), bluebell (*Hyacinthoides non-scripta*), wood anemone (*Anemone nemorosa*) and wood sorrel (*Oxalis acetosella*). Small shrubs that grow on the forest floor include blaeberry (*Vaccinium myrtillus*) and cowberry (*Vaccinium vitis-idaea*).*[2] Birds found in birch woodland include the chaffinch, tree pipit, willow warbler, nightingale, robin, woodcock, redpoll and green woodpecker.*[4]

The branches of the silver birch often have tangled masses of twigs known as witch's brooms growing among them, caused by the fungus *Taphrina betulina*. Old trees are often killed by the decay fungus *Piptoporus betulinus* and fallen branches rot rapidly on the forest floor. This tree commonly grows with the mycorrhizal fungus *Amanita muscaria* in a mutualistic relationship. This applies particularly to acidic or nutrient-poor soils. Other mycorrhizal associates include *Leccinum scabrum* and *Cantharellus cibarius*.*[2] It has been shown that, as well as mycorrhiza, the presence of microfauna in the soil assists the growth of the tree, as it enhances the mobilization of nutrients.*[12]

The larvae of a large number of species of butterflies, moths and other insects feed on the leaves and other parts of the silver birch.*[13] In Germany, almost 500 species of insect have been found on silver and downy birch including 106 beetles and 105 lepidopterans, with 133 insect species feeding almost exclusively on birch.*[14] In the United States, the wood is attacked by the bronze birch borer (*Agrilus anxius*), an insect pest to which it has no natural resistance.*[5]

8.5 Uses

Silver birch is often planted in parks and gardens, grown for its white bark and gracefully drooping shoots, sometimes even in warmer-than-optimum places such as Los Angeles and Sydney. In Scandinavia and other regions of northern Europe, it is grown for forest products such as lumber and pulp, as well as for aesthetic purposes and ecosystem services. It is sometimes used as a pioneer and nurse tree elsewhere.*[1]

Silver birch wood is pale in colour with no distinct heartwood and is used in making furniture, plywood, veneers, parquet blocks, skis, kitchen utensils and in turnery. It makes a good firewood that produces a good heat when burnt but is quickly consumed by the flames. Slabs of bark are used for making roof shingles and wooden footwear.*[1] Historically, the bark was used for tanning. Bark can be heated and the resin collected; the resin is an excellent waterproof glue and useful for starting fires. The thin sheets of bark that peel off young wood contain a waxy resin and are easy to ignite even when wet. The dead twigs are also useful as kindling for outdoor fires.*[15]

Birch brushwood is used for racecourse jumps and besom brooms. In the spring, large quantities of sap rise up the trunk and this can be tapped. It contains around 1% sugars and can be used in a similar way to maple syrup, being drunk fresh, concentrated by evaporation or fermented into a "wine".*[15] In Sweden, the bark of birch trees was ground up and used to make bark bread, a form of famine food. The removal of bark was at one time so widespread that Carl Linnaeus expressed his concern for the survival of the woodlands.*[16]

Silver birch is used in traditional medicine as a diuretic and is reputed to be useful in the treatment of high blood pressure, high cholesterol, obesity, gout, kidney stones, nephritis, cystitis, digestive disturbances and respiratory diseases. For these purposes, a decoction of the bark or leaves is generally used. Externally silver birch is used to promote healing, relieve pain and treat inflammations and infections of the skin such as eczema and psoriasis.*[17]

The outer part of the bark contains up to 20% betulin. The main components in the essential oil of the buds are α-copaene (~10%), germacrene D (~15%) and δ-cadinene (~13%).*[18] Also present in the bark are other triterpene substances which have been shown to have anti-inflammatory, antiviral and anti-cancer properties.*[19]

The silver birch is Finland's national tree.*[20] Leafy, fragrant boughs of silver birch (called vihta or vasta) are used to gently beat oneself in the Finnish sauna culture.*[21]

8.6 Cultivation

Successful birch cultivation requires a climate cool enough for at least the occasional winter snowfall. As they are shallow-rooted, they may require water during dry periods. They grow best in full sun planted in deep, well-drained soil.*[22]

8.6.1 Cultivars

- 'Carelica' is called "curly birch" in Finland; the wood is hard and decorative and is used in wood-carving.*[23]
- 'Laciniata' agm (commonly misidentified as 'Darlecarlica') has deeply incised leaves and weeping branches.*[24]
- 'Purpurea' has dark purple leaves.*[25]
- 'Tristis' agm has an erect trunk with weeping branchlets.*[26]
- 'Youngii' has dense, twiggy weeping growth with no central leader and requires being grafted onto a standard stem of normal silver birch.*[27]

The cultivars marked agm above have gained the Royal Horticultural Society's Award of Garden Merit.

8.7 See also

- List of Lepidoptera that feed on birches

8.8 References

[1] Vedel, Helge; Lange, Johan (1960). *Trees and Bushes*. Methuen. pp. 141–143. ISBN 978-0-416-61780-1.

[2] Featherstone, Alan Watson. "Silver birch, downy birch". Trees for Life. Retrieved 2014-05-28.

[3] "GRIN Taxonomy for Plants - *Betula pendula*". USDA Agricultural Research Service. Retrieved 2014-05-29.

[4] "Silver birch: *Betula pendula*". Forestry Commission. Retrieved 2014-05-28.

[5] "European White Birch - *Betula pendula*" (PDF). USDA Forest Service. 2006-09-01. Retrieved 2014-05-29.

[6] Diamond, Joshua; Browning, Mark; Williams, Andrew; Middleton, John (2003). "Lack of Evidence for Impact of the European White Birch, *Betula pendula*, on the Hydrology of Wainfleet Bog, Ontario". *Canadian Field-Naturalist* **117** (3).

[7] Hunt, D., ed. (1993). *Betula*. Proceedings of the IDS Betula Symposium 2–4 October 1992. p. 51. International Dendrology Society ISBN 0-9504544-5-1.

[8] OECD (2008). *Novel Food and Feed Safety SET 1: Safety Assessment of Transgenic Organisms OECD Consensus Documents Volumes 1 and 2*. OECD Publishing. p. 58. ISBN 978-92-64-05346-5.

[9] Anderberg, Arne (1999-10-14). "*Betula pendula* Roth". *Den virtuella floran*. Naturhistoriska riksmuseet. Retrieved 2014-05-29.

[10] Govaerts, R.; Frodin, D. G. (1998). *World Checklist and Bibliography of Fagales*. ISBN 1-900347-46-6 online search

[11] Govaerts, R. (1996). "Proposal to reject the name *Betula alba* (Betulaceae)". *Taxon* **45**: 697–698. doi:10.2307/1224262.

[12] Setälä, Heikki; Huhta, Veikko (1991). "Soil Fauna Increase *Betula pendula* Growth: Laboratory Experiments With Coniferous Forest Floor". *Ecology* **72** (2): 665–671. JSTOR 2937206.

[13] "HOSTS - a Database of the World's Lepidopteran Hostplants". Natural History Museum. Retrieved 2014-05-29.

[14] Brändle, Martin; Brandl, Roland (2001). "Species richness of insects and mites on trees: expanding Southwood". *Journal of Animal Ecology* **70** (3): 491–504. doi:10.1046/j.1365-2656.2001.00506.x.

[15] Cox, Michael O. "Firewood types: silver birch". WoodstoveWizard.com. Retrieved 2014-05-29.

[16] Julie Lindahl (2011-01-09). "Bark Bread is back". *Nordic Wellbeing*. Retrieved 2011-07-21.

[17] "*Betula pendula* - Roth.". *Plants for a future*. Retrieved 2014-11-05.

[18] Demirci, Betül; Paper, Dietrich H.;Demirci, Fatih; Başer, K. Hüsnü Can; Franz, Gerhard (2004). "Essential Oil of *Betula pendula* Roth. Buds". *Evidence-Based Complementary and Alternative Medicine* **1** (3): 301–303. doi:10.1093/ecam/neh041. PMID 15841263.

[19] Kovac-Besović, E. E.; Durić, K.; Kalodera, Z.; Sofić, E (2009). "Identification and isolation of pharmacologically active triterpenes in Betuale cortex, *Betula pendula* Roth., Betulaceae". *Bosnian Journal of Basic Medical Sciences* **9** (1): 31–38. PMID 19284392.

[20] Katriina Anttila (2005). "Suomen kansallistunnukset (Finland's national emblems)". Retrieved 2014-05-30.

[21] "Perinteinen saunavihta (Traditional sauna vihta)". Visit sauna. Retrieved 2014-05-30.

[22] Botanica (1999). *Botanica's Trees & Shrubs*. Laurel Glen Publishing A. p. 139. ISBN 978-1-57145-649-6.

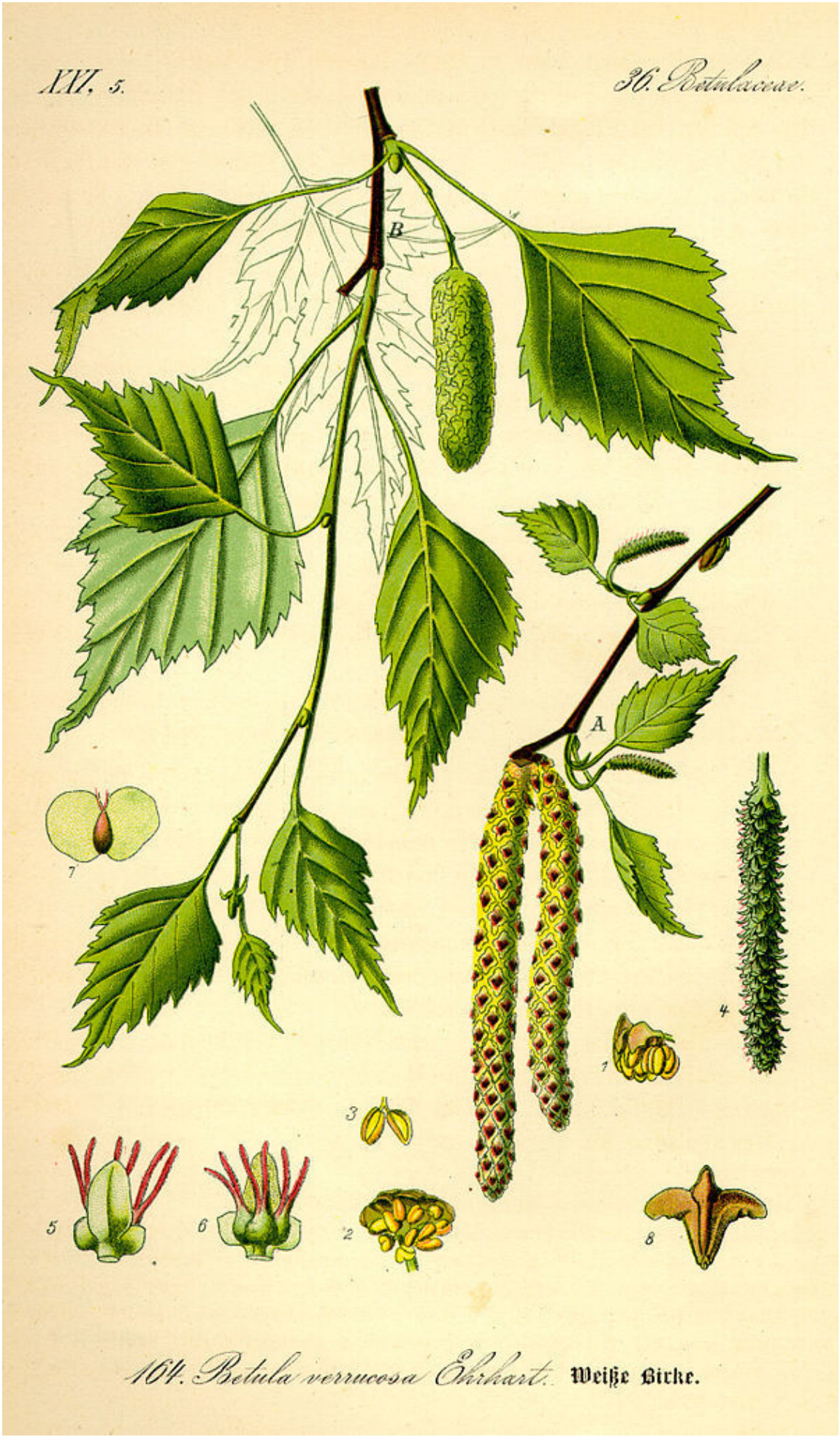
[23] "*Betula pendula* var. carelica - curly birch". Arboretum Mustila. Retrieved 2014-11-12.

[24] "RHS Plant Selector - *Betula pendula* 'Laciniata'". Royal Horticultural Society. Retrieved 2013-06-14.

[25] "RHS Plant Selector - *Betula pendula* 'Purpurea'". Royal Horticultural Society. Retrieved 2014-11-12.

[26] "RHS Plant Selector - *Betula pendula* 'Tristis'". Royal Horticultural Society. Retrieved 2013-06-14.

[27] "RHS Plant Selector - *Betula pendula* 'Youngii'". Royal Horticultural Society. Retrieved 2014-11-12.



Silver birch

Tree in winter

*Birch sawfly (*Craesus septentrionalis*) larvae feeding on silver birch, West Wales, July 2014*

Foliage coloring in Autumn

Betula pendula *'Laciniata'*

Chapter 9

Betula pubescens

Betula pubescens (syn. *Betula alba*; **downy birch**; also known as **moor birch**,*[1] **white birch**, **European white birch** or **hairy birch**) is a species of birch, native and abundant throughout northern Europe, Iceland, northern Asia and Greenland.*[2]

9.1 Characteristics

It is a deciduous tree growing to 10–20 m tall (rarely to 27 m), with a slender crown and a trunk up to 70 cm (exceptionally 1 m) diameter, with smooth but dull grey-white bark finely marked with dark horizontal lenticels. The shoots are grey-brown and finely downy. The leaves are ovate-acute, 2–5 centimetres (0.79–1.97 in) long and 1.5-4.5 cm broad, with a finely serrated margin. The flowers are wind-pollinated catkins, produced in early spring before the leaves. The fruit is a pendulous, cylindrical aggregate 1–4 centimetres (0.39–1.57 in) long and 5–7 millimetres (0.20–0.28 in) diameter, which disintegrates at maturity, releasing the individual seeds; these are 2 millimetres (0.079 in)long with two small wings along the side.

9.1.1 Species identification

It is closely related to, and often confused with, the silver birch (*B. pendula*). Many North American texts treat the two species as conspecific (and cause confusion by combining the downy birch's alternative vernacular name, white birch, with the scientific name *B. pendula* of the other species), but they are regarded as distinct species throughout Europe.

Downy birch can be distinguished from silver birch in having smooth, downy shoots, which are hairless and warty in silver birch. The bark of the downy birch is a dull greyish white, whereas the silver birch has striking white, papery bark with black fissures. The leaf margins also differ, finely serrated in downy birch, coarsely double-toothed in silver birch. They are also distinguished cytologically, silver birch being diploid (with two sets of chromosomes), whereas downy birch is tetraploid (four sets of chromosomes). The two have differences in habitat requirements, with downy birch more common on wet, poorly drained sites, such as clays and peat bogs, and silver birch found mainly on dry, sandy soils.

9.1.2 Distribution

Downy birch extends farther north into the Arctic than any other broadleaf tree. Specimens of the subarctic populations are usually small and very contorted, and are often distinguished as "arctic" downy birch, *Betula pubescens* subsp. *tortuosa* (not to be confused with *Betula nana*). This subspecies is notable as being one of few trees native to Iceland and Greenland, where large specimens can reach 13 metres (43 ft).

Betula pubescens *near a path encircling a lake inside the Arctic Circle in Tromsø*

A subspecies of downy birch forms the treeline in most of Scandinavia.

9.2 Cultivars

- 'Pendula' - with a leader and weeping branches*[3]
- 'Pendula Nana' - umbrella-shaped without a leader and with weeping branches*[3]

9.3 Uses

In Sweden, the bark of birch trees was ground up and used to make a form of bread. In Finland, a traditional Easter food, mämmi, was always packed and baked in boxes of birch bark. Nowadays, cardboard boxes are used, but imprinted with the typical bark pattern.*[4] In Iceland cuttings of the Bjork tree is used for making a sweet birch sweet liqueur.*[5] The removal of bark was at one time so widespread, Carl Linnaeus expressed his concern for the survival of the woodlands.*[6]

9.4 References

[1] Cirrus Digital: Moor Birch *Betula pubescens*

[2] Den virtuella floran: *Betula pubescens* distribution

[3] Govaerts, R., Michielsen, K. & Jablonski, E. (2011). Untraced Weeping Broadleaf cultivars: an overview. *Belgische Dendrologie Belge* 2009: 19–30.

[4] Nordic Recipe Archive "Origin"

[5] *Foss Distillery*

[6] Lindahl, Julie (January 9, 2011). "Bark Bread is back" . *Nordic Wellbeing*. Retrieved July 21, 2011.

Chapter 10

Beech

"Beechwood" redirects here. For other uses, see Beechwood (disambiguation).
For other uses, see Beech (disambiguation).

Beech (*Fagus*) is a genus of deciduous trees in the family Fagaceae, native to temperate Europe, Asia and North America. Recent classification systems of the genus recognize ten to thirteen species in two distinct subgenera, *Engleriana* and *Fagus*.[*][1][*][2] The *Engleriana* subgenus is found only in East Asia, and is notably distinct from the *Fagus* subgenus in that these beeches are low-branching trees, often made up of several major trunks with yellowish bark. Further differentiating characteristics include the whitish bloom on the underside of the leaves, the visible tertiary leaf veins, and a long, smooth cupule-peduncle. *Fagus japonica*, *Fagus engleriana*, and the species *F. okamotoi*, proposed by the bontanist Chung-Fu Shen in 1992, comprise this subgenus.[*][2] The better known *Fagus* subgenus beeches are high-branching with tall, stout trunks and smooth silver-grey bark. This group includes *Fagus sylvatica*, *Fagus grandifolia*, *Fagus crenata*, *Fagus lucida*, *Fagus longipetiolata*, and *Fagus hayatae*.[*][2] The classification of the European beech, *Fagus sylvatica* is complex, with a variety of different names proposed for different species and subspecies within this region (for example *Fagus taurica*, *Fagus orientalis*, and *Fagus moesica*[*][3]). Research suggests that beeches in Eurasia differentiated fairly late in evolutionary history, during the Miocene. The populations in this area represent a range of often overlapping morphotypes, though genetic analysis does not clearly support separate species.[*][4]

Within its family, the Fagaceae, recent research has suggested that *Fagus* is the evolutionarily most basal group.[*][5] The **southern beeches** (*Nothofagus* genus) previously thought closely related to beeches, are now treated as members of a separate family, Nothofagaceae. They are found in Australia, New Zealand, New Guinea, New Caledonia, Argentina and Chile (principally Patagonia and Tierra del Fuego).

The European beech (*Fagus sylvatica*) is the most commonly cultivated, although there are few important differences between species aside from detail elements such as leaf shape. The leaves of beech trees are entire or sparsely toothed, from 5–15 cm long and 4–10 cm broad. Beeches are monoecious, bearing both male and female flowers on the same plant. The small flowers are unisexual, the female flowers borne in pairs, the male flowers wind-pollinating catkins. They are produced in spring shortly after the new leaves appear. The bark is smooth and light grey. The fruit is a small, sharply three–angled nut 10–15 mm long, borne singly or in pairs in soft-spined husks 1.5–2.5 cm long, known as cupules. The husk can have a variety of spine- to scale-like appendages, the character of which is, in addition to leaf shape, one of the primary ways beeches are differentiated.[*][2] The nuts are edible, though bitter (though not nearly as bitter as acorns) with a high tannin content, and are called beechnuts or beechmast.

The name of the tree (Latin fagus, whence the species name; cognate with English "beech") is of Indo-European origin, and played an important role in early debates on the geographical origins of the Indo-European people. Greek φηγός is from the same root, but the word was transferred to the oak tree (e.g. Iliad 16.767) as a result of the absence of beech trees in Greece. [*][6]

10.1 Habitat

Beech grows on a wide range of soil types, acidic or basic, provided they are not waterlogged. The tree canopy casts dense shade, and carpets the ground thickly with leaf litter.

In North America, they often form beech-maple climax forests by partnering with the sugar maple.

The beech blight aphid (*Grylloprociphilus imbricator*) is a common pest of American beech trees. Beeches are also used as food plants by some species of Lepidoptera (see list of Lepidoptera that feed on beeches).

Beech bark is extremely thin and scars easily. Since the beech tree has such delicate bark, carvings, such as lovers' initials and other forms of graffiti, remain because the tree is unable to heal itself.*[7]

Beech bark disease is a fungal infection that attacks the American beech through damage caused by scale insects.*[8] Infection can lead to the death of the tree .*[9]

10.2 Distribution

10.2.1 Britain and Ireland

Beech was a late entrant to Great Britain after the last glaciation, and may have been restricted to basic soils in the south of England. Some suggest that it was introduced by Neolithic tribes who planted the trees for their edible nuts.*[10] The beech is classified as a native in the south of England and as a non-native in the north where it is often removed from 'native' woods.*[11] Large areas of the Chilterns are covered with beech woods, which are habitat to the common bluebell and other flora. The Cwm Clydach National Nature Reserve in southeast Wales was designated for its beech woodlands which are believed to be on the western edge of their natural range in this steep limestone gorge.*[12]

Beech is not native to Ireland; however, it was widely planted from the 18th century, and can become a problem shading out the native woodland understory. The Friends of the Irish Environment say that the best policy is to remove young, naturally regenerating beech while retaining veteran specimens with biodiversity value.*[13]

There is a campaign by Friends of the Rusland Beeches*[14] and South Lakeland Friends of the Earth*[15] launched in 2007 to reclassify the beech as native in Cumbria.*[16] The campaign is backed by Tim Farron MP who tabled a motion on 3 December 2007 regarding the status of beech in Cumbria.*[17]

Today, beech is widely planted for hedging and in deciduous woodlands, and mature, regenerating stands occur throughout mainland Britain below about 650 m.*[18] The tallest and longest hedge in the world (according to *Guinness World Records*) is the Meikleour Beech Hedge in Meikleour, Perth and Kinross, Scotland.

10.2.2 Continental Europe

The common European beech (*Fagus sylvatica*) grows naturally in Denmark and southern Norway and Sweden up to about the 57th – 59th northern latitude. The most northern known naturally growing (not planted) beech trees are found in a few very small forests around the city of Bergen on the west coast of Norway with the North Sea nearby. Near the city of Larvik is the largest naturally occurring beech forest in Norway. Planted beeches are grown much farther north along the Norwegian coast.

There is some research suggesting that early agriculture patterns supported the spread of beech in continental Europe. Research has linked the establishment of beech stands in Scandinavia and Germany with cultivation and fire disturbance, i.e. early agricultural practices. Other areas which have a long history of cultivation, Bulgaria for example, do not exhibit this pattern, so it is as yet unclear how much human activity has influenced the spread of beech trees.*[19]

As a naturally growing forest tree, it marks the important border between the European deciduous forest zone and the northern pine forest zone. This border is important for both wildlife and fauna and is a sharp line along the Swedish western coast, which gets broader toward the south. In Denmark and in Scania, at the southernmost peak of the Scandinavian peninsula, south-west of the natural Spruce boundary, it's the most common forest tree. In Norway, the beech migration was very recent, and the species has not reached its distribution potential. Thus, the occurrence of oak in Norway is used as an indicator of the border between the temperate deciduous forest and the boreal spruce – pine forest.

Fagus Sylvatica is one of the most common hardwood trees in north central Europe, in France alone comprising about 15% of all non-conifers.

European beech with unusual aerial roots in a wet Scottish glen.

10.2.3 North America

The American beech (*Fagus grandifolia*) occurs across much of the eastern United States and southeastern Canada, with a disjunct population in Mexico. It is the only *Fagus* species in the Western Hemisphere. Prior to the Pleistocene Ice Age, it is believed to have spanned the entire width of the continent from the Atlantic Ocean to the Pacific, but now is confined to east of the Great Plains. *F. grandifolia* tolerates hotter climates than its European cousin, but is not planted much as an ornamental due to slower growth and less resistance to urban pollution. It most commonly

European beech (Fagus sylvatica).

occurs as an overstory component in the northern part of its range with sugar maple, transitioning to other forest types further south such as beech-magnolia. American beech is rarely encountered in developed areas unless as a remnant of a forest that was cut down for land development.

10.2.4 Asia

East Asia is home to five species of *Fagus*, only one of which (*F. crenata*) is occasionally planted in Western countries. Smaller than *F. sylvatica* and *F. grandifolia*, Japanese beech is one of the most common hardwoods in its native range.

10.3 Uses

Beech wood is an excellent firewood, easily split and burning for many hours with bright but calm flames. Chips of beech wood are used in the brewing of Budweiser beer as a fining agent. Beech logs are burned to dry the malts used in some German smoked beers, giving the beers their typical flavour. Beech is also used to smoke Westphalian ham,[*][20] various sausages,[*][21] and some cheeses.

Some drums are made from beech, which has a tone between those of maple and birch, the two most popular drum woods.

The textile modal is a kind of rayon often made wholly from the reconstituted cellulose of pulped beech wood.[*][22][*][23][*][24]

Beechnuts in autumn.

The European species *Fagus sylvatica* yields a utility timber that is tough but dimensionally unstable. It weighs about 720 kg per cubic metre and is widely used for furniture framing and carcass construction, flooring and engineering purposes, in plywood and in household items like plates, but rarely as a decorative wood. The timber can be used to build chalets, houses and log cabins.

Beech wood is used for the stocks of military rifles when traditionally preferred woods such as walnut are scarce or unavailable or as a lower-cost alternative.*[25]

The fruit of the beech tree is known as *beechnuts* or *mast* and is found in small burrs that drop from the tree in autumn. It is small, roughly triangular and edible, with a bitter, astringent taste. They have a high enough fat content that they can be pressed for edible oil. Fresh from the tree, beech leaves are a fine salad vegetable, as sweet as a mild cabbage though much softer in texture.*[26] The young leaves can be steeped in gin for several weeks, the liquor strained off and sweetened to give a light green/yellow liqueur called beechleaf noyau.

Beech wood tablets were a common writing material in Germanic societies before the development of paper. The Old English *bōc*[27] and Old Norse *bók*[28] both have the primary sense of "beech" but also a secondary sense of "book", and it is from *bōc* that the modern word derives.*[29] In modern German, the word for "book" is *Buch,* with *Buche* meaning "beech tree". In Swedish, these words are the same, *bok* meaning both "beech tree" and "book". Similarly, in Russian, the word for beech is *бук* (buk), while that for letter (as in a letter of the alphabet) is *буква* (bukva).

The pigment bistre was made from beech wood soot.

10.3.1 As an ornamental

The beech most commonly grown as an ornamental tree is the European beech (*Fagus sylvatica*), widely cultivated in North America as well as its native Europe. Many varieties are in cultivation, notably the weeping beech *F. sylvatica* 'Pendula', several varieties of copper or purple beech, the fern-leaved beech *F. sylvatica* 'Asplenifolia', and the tricolour beech *F. sylvatica* 'roseomarginata'. The strikingly columnar Dawyck beech (*F. sylvatica* 'Dawyck')

*North American beech (*Fagus grandifolia*), seen in autumn.*

occurs in green, gold and purple forms, named after Dawyck Botanic Garden in the Scottish Borders, one of the four garden sites of the Royal Botanic Garden Edinburgh. Europe is also home to the lesser-known Oriental beech (*F. orientalis*) and Crimean beech (*F. taurica*).

*Chinese beech (*Fagus engleriana*).*

10.4 See also

- Beech bark disease
- Beech blight aphid
- English Lowlands beech forests
- Nothofagus - the Southern beeches
- Primeval Beech Forests of the Carpathians and the Ancient Beech Forests of Germany
- Sylvatica ecology cycle 'Sylvatic' means 'occurring in or affecting wild animals'

10.5 References

[1] Denk, Thomas with Guido Grimm and Vera Hemleben. 2005. Patterns of Molecular and Morphological Differentiation in *Fagus* (Fagaceae): Phylogenetic Implications. American Journal of Botany 92(6):1006-1016.

[2] Shen, Chung-Fu. 1992. A Monograph of the Genus *Fagus* Tourn. Ex L. (Fagaceae). Ph.D. Dissertation, City University of New York.

[3] Gomory, D. with L. hi , R. Brus, P. Zhelev, Z. Tomovic, and J. Gracan. 1999. Genetic differentiation and phylogeny of beech on the Balkan peninsula. Journal of Evolutionary Biology 12: 746-752.

[4] Denk, Thomas with Guido Grimm, K. Stogerer, M. Langer, Vera Hemleben 2002. The evolutionary history of *Fagus* in western Eurasia: Evidence from genes, morphology and the fossil record. Plant Systematics and Evolution 232:213-236.

[5] Manos, Paul S. with Kelly P. Steele. 1997. Phylogenetic analysis of "Higher" Hamamelididae based on Plasid Sequence Data. American Journal of Botany 84(10):1407-1419.

[6] Robert Beekes, Etymological Dictionary of Greek, Leiden and Boston 2010, pp. 1565–6

[7] Lawrence, Gale. A Field Guide to the Familiar: Learning to Observe the Natural World. Hanover: University Press of New England, 1984. 75-76. Print.

[8] "beech." The Columbia Encyclopedia. New York: Columbia University Press, 2008. Credo Reference. Web. 17 September 2012.

[9] beech bark disease." Dictionary of Microbiology & Molecular Biology. Hoboken: Wiley, 2006. Credo Reference. Web. 27 September 2012.

[10] "?". Retrieved 4 August 2010.

[11] "International Foresters Study Lake District's greener, friendlier forests". Forestry Commission. Retrieved 4 August 2010.

[12] "Cwm Clydach". Countryside Council for Wales Landscape & wildlife. Retrieved 4 August 2010.

[13] "?". Retrieved 4 August 2010.

[14] Friends of the Rusland Beeches

[15] "?". South Lakeland Friends of the Earth. Retrieved 4 August 2010.

[16] Armstrong, J (2007-10-19). "Saving Our Beeches". North West Evening Mail. Archived from the original on 2010-10-28.

[17] UK Parliament – Early Day Motions By Details

[18] Preston, Pearman & Dines (2002) New Atlas of the British Flora. Oxford University Press

[19] Bradshaw, R.H.W. with N. Kito and T. Giesecke. 2010. Factors influencing the Holocene history of Fagus. Forest Ecology and Management 259:2204-2212.

[20] http://www.germanfoods.org/consumer/facts/guidetoham.cfm

[21] http://www.cookthink.com/reference/823/What_is_andouille

[22] holistic-interior-designs.com, *Modal Fabric*, retrieved 9 October 2011

[23] uniformreuse.co.uk, *Modal data sheet*, retrieved 9 October 2011

[24] fabricstockexchange.com, *Modal* (dictionary entry), retrieved 9 October 2011

[25] Walter J. (2006) Rifles of the World, 3rd edition. Krause Publicatioins, Wisconsin US

[26] Food for free (2004)

[27] A Concise Anglo-Saxon Dictionary, Second Edition (1916), Blōtan-Boldwela, John R. Clark Hall

[28] An Icelandic-English Dictionary (1874), Borðsalmr-Bók Cleasby and Vigfusson

[29] Douglas Harper. "Book". *Online Etymological Dictionary*. Retrieved 2011-11-18.

10.6 External links

- "WCSP". *World Checklist of Selected Plant Families* – Fagus.
- Flora of China – *Fagus*
- Flora of North America – *Fagus*
- Eichhorn, Markus (October 2010). "The Beech Tree". *Test Tube*. Brady Haran for the University of Nottingham.

Chapter 11

Fagus sylvatica

Fagus sylvatica, the **European beech** or **common beech**, is a deciduous tree belonging to the beech family Fagaceae.

11.1 Description

Copper beech in autumn

It is a large tree, capable of reaching heights of up to 50 m (160 ft) tall*[2] and 3 m (9.8 ft) trunk diameter, though more typically 25–35 m (82–115 ft) tall and up to 1.5 m (4.9 ft) trunk diameter. A 10-year-old sapling will stand about 4 m (13 ft) tall. It has a typical lifespan of 150 to 200 years, though sometimes up to 300 years. 30 years are needed to attain full maturity (as compared to 40 for American beech). Like most trees, its form depends on the location: in forest areas, *F. sylvatica* grows to over 30 m (100 ft), with branches being high up on the trunk. In open locations, it will become much shorter (typically 15–24 m (50–80 ft)) and more massive.

The leaves are alternate, simple, and entire or with a slightly crenate margin, 5–10 cm long and 3–7 cm broad, with 6-7 veins on each side of the leaf (7-10 veins in *Fagus orientalis*). When crenate, there is one point at each vein tip, never any points between the veins. The buds are long and slender, 15–30 mm (0.59–1.18 in) long and 2–3 mm

European beech shoot with nut cupules

(0.079–0.118 in) thick, but thicker (to 4–5 mm (0.16–0.20 in)) where the buds include flower buds.

The leaves of beech are often not abscissed in the autumn and instead remain on the tree until the spring. This process is called marcescence. This particularly occurs when trees are saplings or when plants are clipped as a hedge (making beech hedges attractive screens, even in winter), but it also often continues to occur on the lower branches when the tree is mature.

Small quantities of seeds may be produced around 10 years of age, but not a heavy crop until the tree is at least 30 years old. *F. sylvatica* male flowers are borne in the small catkins which are a hallmark of the Fagales order (beeches, chestnuts, oaks, walnuts, hickories, birches, and hornbeams). The female flowers produce beechnuts, small triangular nuts 15–20 millimetres (0.59–0.79 in) long and 7–10 mm (0.28–0.39 in) wide at the base; there are two nuts in each cupule, maturing in the autumn 5–6 months after pollination. Flower and seed production is particularly abundant in years following a hot, sunny and dry summer, though rarely for two years in a row.

11.2 Distribution and habitat

The natural range extends from southern Sweden to northern Sicily,*[3] west to France, southern England, northern Portugal, central Spain, and east to northwest Turkey, where it intergrades with the oriental beech (*Fagus orientalis*), which replaces it further east. In the Balkans, it shows some hybridisation with oriental beech; these hybrid trees are named *Fagus* × *taurica*. In the southern part of its range around the Mediterranean, it grows only in mountain forests, at 600–1,800 m (1,969–5,906 ft) altitude.

Although often regarded as native in southern England, recent evidence suggests that *F. sylvatica* did not arrive in England until about 4000 BCE, or 2,000 years *after* the English Channel formed after the ice ages; it could have been an early introduction by Stone age man, who used the nuts for food.*[4] The beech is classified as a native in the south

Fagus sylvatica - *MHNT*

Fagus sylvatica pliocenica – *Museum of Toulouse*

of England and as a non-native in the north where it is often removed from 'native' woods.* [5] Localised pollen records have been recorded in the North of England from the Iron Age by Sir Harry Godwin. Changing climatic conditions may put beech populations in southern England under increased stress and while it may not be possible to maintain the current levels of beech in some sites it is thought that conditions for beech in north-west England will remain favourable or even improve. It is often planted in Britain. Similarly, the nature of Norwegian beech populations

is subject to debate. If native, they would represent the northern range of the species. However, molecular genetic analyses support the hypothesis that these populations represent intentional introduction from Denmark before and during the Viking Age.*[6] However, the beech in Vestfold and at Seim north of Bergen in Norway is now spreading naturally and regarded as native.*[7]

Though not demanding of its soil type, the European beech has several significant requirements: a humid atmosphere (precipitation well distributed throughout the year and frequent fogs) and well-drained soil (it cannot handle excessive stagnant water). It prefers moderately fertile ground, calcified or lightly acidic, therefore it is found more often on the side of a hill than at the bottom of a clayey basin. It tolerates rigorous winter cold, but is sensitive to spring frost. In Norway's oceanic climate planted trees grow well as far north as Trondheim.

An old and dense stand of beech trees prepared to be regenerated (notice the young trees underneath the old ones) in the Brussels part of the Sonian Forest

A beech forest is very dark and few species of plant are able to survive there, where the sun barely reaches the ground. Young beeches prefer some shade and may grow poorly in full sunlight. In a clear-cut forest a European beech will germinate and then die of excessive dryness. Under oaks with sparse leaf cover it will quickly surpass them in height and, due to the beech's dense foliage, the oaks will die from lack of sunlight.

11.3 Ecology

The root system is shallow, even superficial, with large roots spreading out in all directions. European beech forms ectomycorrhizas with a range of fungi including members of the genera *Amanita*, *Boletus*, *Cantharellus*, *Hebeloma* and *Lactarius*; these fungi are important in enhancing uptake of water and nutrients from the soil.

In the woodlands of southern Britain, beech is dominant over oak and elm south of a line from about north Suffolk across to Cardigan. Oak are the dominant forest trees north of this line. One of the most beautiful European beech forests called Sonian Forest (*Forêt de Soignes/Zoniënwoud*) is found in the southeast of Brussels. Beech is a dominant tree species in France and constitutes about 10% of French forests. The largest virgin forest made of beech trees (5,012 ha (12,380 acres) in one forest body) is located in the Semenic National Park (Romania). This habitat is home

Fagus sylvatica *wood - MHNT*

of Europe's largest predators (the brown bear, the grey wolf and the lynx). Many trees are older than 350 years in this area*[8]

Spring leaf budding by the European beech is triggered by a combination of day length and temperature. Bud break each year is from the middle of April to the beginning of May, often with remarkable precision (within a few days). It is more precise in the north of its range than the south, and at 600 m (2,000 ft) than at sea level.

The European beech invests significantly in summer and autumn for the following spring. Conditions in summer, particularly good rainfall, determine the number of leaves included in the buds. In autumn, the tree builds the reserves that will sustain it into spring. Given good conditions, a bud can produce a shoot with up to ten or more leaves. The terminal bud emits a hormonal substance in the spring that halts the development of additional buds. This tendency, though very strong at the beginning of their existence, becomes weaker in older trees.

It is only after the budding that root growth of the year begins. The first roots to appear are very thin (with a diameter of less than 0.5 mm). Later, after a wave of above ground growth, thicker roots grow in a steady fashion.

11.4 Cultivation

European beech is a very popular ornamental tree in parks and large gardens in temperate regions of the world. In North America, they are preferred for this purpose over the native *F. grandifolia*, which despite its tolerance of warmer climates, is slower growing, taking an average of 10 years longer to attain maturity. It is frequently kept clipped to make attractive hedges. Since the early 19th century there have been numerous cultivars of European beech made by horticultural selection, often repeatedly; they include:

- copper beech or purple beech (*Fagus sylvatica* Purpurea Group) - leaves purple, in many selections turning deep spinach green by mid-summer. In the United States Charles Sprague Sargent noted the earliest appearance in a nurseryman's catalogue in 1820, but in 1859 "the finest copper beech in America... more than fifty feet high" was noted in the grounds of Thomas Ash, Esq., Throggs Neck, New York;*[9] it must have been more than forty years old at the time.
- fern-leaf beech (*Fagus sylvatica* Heterophylla Group) - leaves deeply serrated to thread-like
- dwarf beech (*Fagus sylvatica* Tortuosa Group) - distinctive twisted trunk and branches

The famous Upside-down Tree, at Hyde Park, London, an example of F. sylvatica *'pendula'*

- weeping beech (*Fagus sylvatica* Pendula Group) - branches pendulous
- Dawyck beech (*Fagus sylvatica* 'Dawyck') - fastigiate growth
- golden beech (*Fagus sylvatica* 'Zlatia') - leaves golden in spring

The following cultivars have gained the Royal Horticultural Society's Award of Garden Merit:-

11.5 Timber

The wood of the European beech is used in the manufacture of numerous objects and implements. Its fine and short grain makes it an easy wood to work with, easy to soak, dye,varnish and glue. Steaming makes the wood even easier to machine. It has an excellent finish and is resistant to compression and splitting. Milling is sometimes difficult due to cracking and it is stiff when flexed. The density of the wood is 720 kg per cubic meter.*[17] It is particularly well suited for minor carpentry, particularly furniture. From chairs to parquetry (flooring) and staircases, the European beech can do almost anything other than heavy structural support, so long as it is not left outdoors. Its hardness make it ideal for making wooden mallets and workbench tops. The wood rots easily if it is not protected by a tar based on a distillate of its own bark (as used in railway sleepers). It is better for paper pulp than many other broadleaved trees though is only sometimes used for this, the high cellulose content can also be spun into modal, which is used as a textile akin to cotton. The code for its use in Europe is fasy (from *FA*gus *SY*lvatica). Common beech is also considered one of the best firewoods for fireplaces.*[18]

11.6 Other uses

Primary Product AM 01, a smoke flavouring, is produced from *Fagus sylvatica L.*[*][19]

The nuts are an important food for birds, rodents and in the past also humans. Slightly toxic to humans if eaten in large quantities due to the tannins they contain, the nuts were nonetheless pressed to obtain an oil in 19th century

Beech planted on a march dyke (boundary hedge) in Scotland.

England that was used for cooking and in lamps. They were also ground to make flour, which could be eaten after the tannins were leached out by soaking.

Detail of the tarcrust's structure.

11.7 Pathogens

Biscogniauxia nummularia (beech tarcrust) is an ascomycete primary pathogen of beech trees, causing strip-canker and wood rot. It can be found at all times of year and is not edible.

11.8 See also

- English Lowlands beech forests

11.9 Notes

[1] "The Plant List".

[2] "Tall Trees".

[3] Brullo, S.; Guarino, R.; Minissale, P.; Siracusa, G.; Spampinato, G. (1999). "Syntaxonomical analysis of the beech forests from Sicily". *Annali di botanica* (La Sapienza) **57**: 121–132. ISSN 2239-3129. Retrieved 5 December 2013.

[4] Harris, E. (2002). Goodbye to Beech? Farewell to Fagus? *Quarterly Journal of Forestry* 96 (2): 97.

[5] International foresters study Lake District's 'greener, friendlier forests' *forestry.gov.uk*

[6] Myking, T.; Yakovlev, I.; Ersland, G. A. (2011). "Nuclear genetic markers indicate Danish origin of the Norwegian beech (*Fagus sylvatica* L.) populations established in 500–1,000 AD". *Tree Genetics & Genomes* **7** (3): 587–596. doi:10.1007/s11295-010-0358-y.

[7] Bøk - en kulturvekst? (Norwegian)

[8] "Parcul Naţional Semenic - Cheile Caraşului (in Romanian)".

[9] Andrew Jackson Downing and Henry Winthrop Sargent, *A Treatise on the Theory and Practice of Landscape Gardening, Adapted to North America* 1859:150.

[10] "*Fagus sylvatica* AGM". Royal Horticultural Society. Retrieved 26 July 2013.

[11] "*Fagus sylvatica* 'Dawyck' AGM". Royal Horticultural Society. Retrieved 26 July 2013.

[12] "*Fagus sylvatica* 'Dawyck Gold' AGM". Royal Horticultural Society. Retrieved 26 July 2013.

[13] "*Fagus sylvatica* 'Dawyck Purple' AGM". Royal Horticultural Society. Retrieved 26 July 2013.

[14] "*Fagus sylvatica* 'Pendula' AGM". Royal Horticultural Society. Retrieved 26 July 2013.

[15] "*Fagus sylvatica* (Atropurpurea Group) 'Riversii' AGM". Royal Horticultural Society. Retrieved 26 July 2013.

[16] "*Fagus sylvatica* var *heterophylla* 'Aslpeniifolia' AGM". Royal Horticultural Society. Retrieved 26 July 2013.

[17] Steamed Beech. Niche Timbers. Accessed 20-08-2009.

[18] "The burning properties of wood" (PDF). *Scoutbase (Scout Information Centre)*. Scout Association. Retrieved 26 July 2013.

[19] European Food Safety Authority (EFSA) Scientific Opinion on Safety of smoke flavour - Primary Product – AM 01 8 January 2010

11.10 External links

- Beech Tree Collection - Photographs By Louis K. Meisel, NY
- Images, location details, and measurements of remarkable beeches
- Den virtuella floran - Distribution

Chapter 12

Buxus

For the asteroid, see 8852 Buxus.
"Boxtree" redirects here. For the publisher, see Macmillan Publishers.
"Boxwood" redirects here. For other uses, see Boxwood (disambiguation).

Buxus is a genus of about 70 species in the family Buxaceae. Common names include **box** (majority of English-

Buxus sempervirens

speaking countries) or **boxwood** (North America).*[1]

The boxes are native to western and southern Europe, southwest, southern and eastern Asia, Africa, Madagascar, northernmost South America, Central America, Mexico and the Caribbean, with the majority of species being tropical or subtropical; only the European and some Asian species are frost-tolerant. Centres of diversity occur in Cuba (about 30 species), China (17 species) and Madagascar (9 species).

They are slow-growing evergreen shrubs and small trees, growing to 2–12 m (rarely 15 m) tall. The leaves are opposite, rounded to lanceolate, and leathery; they are small in most species, typically 1.5–5 cm long and 0.3-2.5 cm broad,

Buxus sinica *foliage*

Buxus henryi *foliage*

but up to 11 cm long and 5 cm broad in *B. macrocarpa*. The flowers are small and yellow-green, monoecious with both sexes present on a plant. The fruit is a small capsule 0.5-1.5 cm long (to 3 cm in *B. macrocarpa*), containing

Buxus wallichiana *foliage and seed capsules*

several small seeds.

The genus splits into three genetically distinct sections, each section in a different region, with the Eurasian species in one section, the African (except northwest Africa) and Madagascan species in the second, and the American species in the third. The African and American sections are genetically closer to each other than to the Eurasian section.*[2]

12.1 Selected species

Europe, northwest Africa, Asia

- *Buxus austro-yunnanensis* (Yunnan Box; southwest China)
- *Buxus balearica* (Balearic Box; Balearic Islands, southern Spain, northwest Africa)
- *Buxus bodinieri* (China)
- *Buxus cephalantha* (China)
- *Buxus cochinchinensis* (Malaysia)
- *Buxus colchica* (Georgian Box; western Caucasus; considered also a syn. of *B. sempervirens*)
- *Buxus hainanensis* (Hainan Box; China: Hainan)
- *Buxus harlandii* (Harland's Box; southern China)
- *Buxus hebecarpa* (China)
- *Buxus henryi* (Henry's Box; China)

Buxus sempervirens *bark*

- *Buxus hyrcana* (Caspian Box; Alborz, eastern Caucasus; considered also a syn. of *B. sempervirens*)
- *Buxus ichangensis* (China)
- *Buxus latistyla* (China)
- *Buxus linearifolia* (China)
- *Buxus megistophylla* (China)
- *Buxus microphylla* (Japanese Box; Korea, China; long cultivated in Japan)
- *Buxus mollicula* (China)
- *Buxus myrica* (China)
- *Buxus papillosa* (western Himalaya)
- *Buxus pubiramea* (China)
- *Buxus rivularis* (Philippines)
- *Buxus rolfei* (Borneo)
- *Buxus rugulosa* (China, eastern Himalaya)
- *Buxus rupicola* (Malaysia)
- *Buxus sempervirens* (Common Box or European Box; western and southern Europe, except far southwest)
- *Buxus sinica* (Chinese Box; China, Korea, Japan)
- *Buxus stenophylla* (China)

Buxus sempervirens *bark closeup*

- *Buxus wallichiana* (Himalayan Box; Himalaya)

Africa, Madagascar

- *Buxus acuminata* (Africa: Zaire; syn. *Notobuxus acuminata*)
- *Buxus calcarea* (Madagascar endemic)
- *Buxus capuronii* (Madagascar endemic)
- *Buxus hildebrantii* (eastern Africa: Somalia, Ethiopia)
- *Buxus humbertii* (Humbert's Box; Madagascar endemic)
- *Buxus itremoensis* (Madagascar endemic)
- *Buxus lisowskii* (Congo)

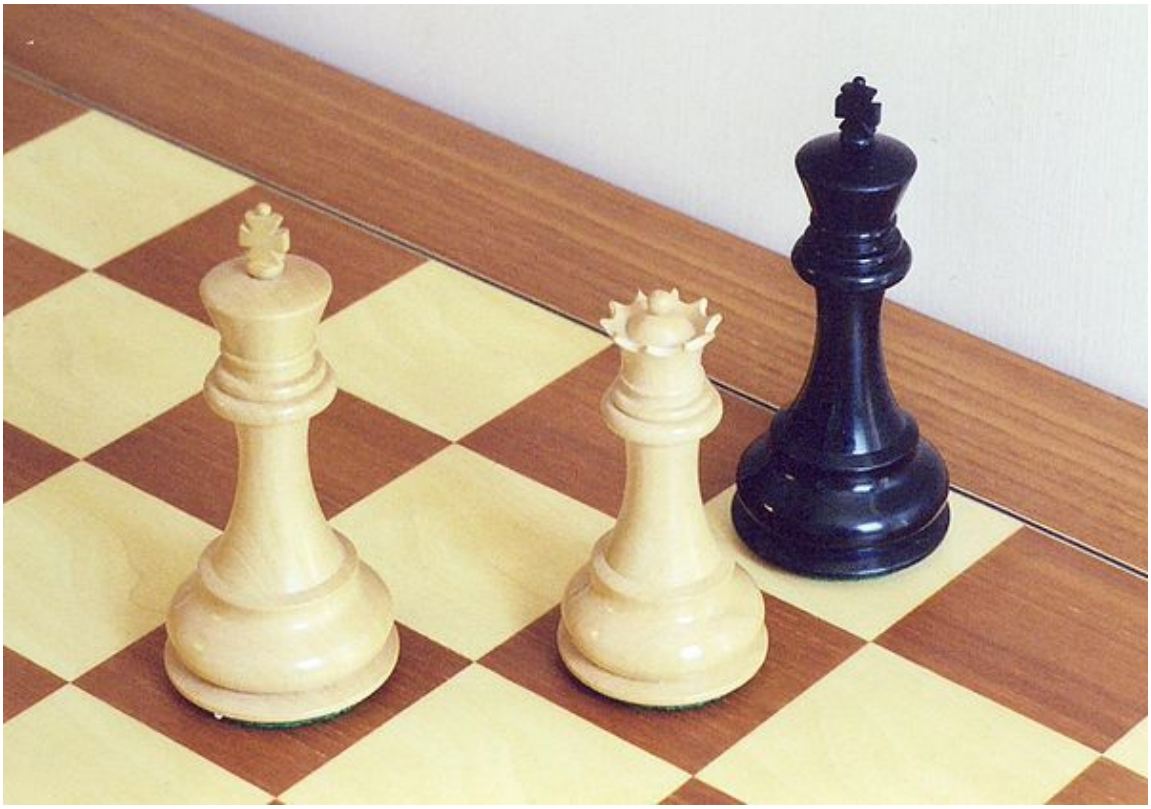
- *Buxus macowanii* (Cape Box; eastern and northern South Africa)
- *Buxus macrocarpa* (Madagascar endemic)
- *Buxus madagascarica* (Madagascan Box; Madagascar, Comoros)
- *Buxus monticola* (Madagascar endemic)
- *Buxus moratii* (Madagascar, Comoros)
- *Buxus natalensis* (Natal Box; eastern South Africa; syn. *Notobuxus natalensis*)
- *Buxus obtusifolia* (eastern Africa; syn. *Notobuxus obtusifolia*)
- *Buxus rabenantoandroi* (Madagascar endemic; syn. *B. angustifolia* GE Schatz & Lowry *non* Mill.)

Americas

- *Buxus aneura* (Cuba)
- *Buxus bartletii* (Central America)
- *Buxus brevipes* (Cuba)
- *Buxus citrifolia* (Venezuela)
- *Buxus crassifolia* (Cuba)
- *Buxus ekmanii* (Cuba)
- *Buxus excisa* (Cuba)
- *Buxus heterophylla* (Cuba)
- *Buxus imbricata* (Cuba)
- *Buxus lancifolia* (Mexico)
- *Buxus macrophylla* (Central America)
- *Buxus mexicana* (Mexico)
- *Buxus muelleriana* (Cuba)
- *Buxus olivacea* (Cuba)
- *Buxus pilosula* (Cuba)
- *Buxus portoricensis* (Puerto Rico)
- *Buxus pubescens* (Mexico)
- *Buxus rheedioides* (Cuba)
- *Buxus vahlii* (Vahl's Box or Smooth Box; Puerto Rico; syn. *B. laevigata*)

12.2 Uses

Box plants are commonly grown as hedges and for topiary.



The white pieces are made of boxwood. The black piece is ebonized, not ebony.

12.2.1 Wood carving

Owing to its fine grain it is a good wood for fine wood carving, although this is limited by the small sizes available. It is also resistant to splitting and chipping, and thus useful for decorative or storage boxes. Formerly, it was used for wooden combs. As a timber or wood for carving it is "boxwood" in all varieties of English.

Owing to the relatively high density of the wood (it is one of the few woods that are denser than water), boxwood is often used for chess pieces, unstained boxwood for the white pieces and stained ('ebonized') boxwood for the black pieces, in lieu of ebony.*[3]

The extremely fine endgrain of box makes it suitable for woodblock printing and woodcut blocks, for which it was the usual material in Europe.

High quality wooden spoons have usually been carved from box, with beech being the usual cheaper substitute.

Boxwood was once called dudgeon, and was used for the handles of dirks, and daggers, with the result that such a knife was known as a dudgeon. Although one "in high dudgeon" is indignant and enraged, and while the image of a dagger held high, ready to plunge into an enemy, has a certain appeal, lexicographers have no real evidence as to the origin of the phrase.

12.2.2 Musical instruments

Due to its high density and resistance to chipping, boxwood is a relatively economical material used to make parts for various stringed instruments. It is mostly used to make tailpieces, chin rests and tuning pegs, but may be used for a variety of other parts as well. Other woods used for this purpose are rosewood and ebony.

Boxwood was a common material for the manufacture of recorders in the eighteenth century, and a large number of mid- to high-end instruments made today are produced from one or other species of boxwood. Boxwood was once a popular wood for other woodwind instruments, and was among the traditional woods for Great Highland bagpipes before tastes turned to imported dense tropical woods such as cocuswood, ebony, and African blackwood.*[4]

12.3 See also

- Boxwood blight
- Box Tree Moth

12.4 References

[1] Only the wood as a material is "boxwood" in British English

[2] von Balthazar, M.; Endress, P. K.; Qiu, Y.-L. (2000). "Phylogenetic relationships in Buxaceae based on nuclear internal transcribed spacers and plastid *ndhF* sequences". *International Journal of Plant Science* **161** (5): 785–792. doi:10.1086/314302.

[3] "Chess Piece Materials". The Chess Zone.

[4] Joshua Dickson (9 October 2009). *The Highland bagpipe: music, history, tradition*. Ashgate Publishing, Ltd. pp. 50–. ISBN 978-0-7546-6669-1. Retrieved 29 April 2011.

12.5 External links

- Box / Royal Horticultural Society
- American Boxwood Society
- Revision of the genus Buxus in Madagascar (pdf file)

Chapter 13

Buxus sempervirens

Buxus sempervirens (**common box**, **European box**, or **boxwood**), is a species of flowering plant in the genus *Buxus*, native to western and southern Europe, northwest Africa, and southwest Asia, from southern England south to northern Morocco, and east through the northern Mediterranean region to Turkey.*[1]*[2]*[3] *Buxus colchica* of western Caucasus and *B. hyrcana* of northern Iran and eastern Caucasus are commonly treated as synonyms of *B. sempervirens*.*[4]*[5]

13.1 Description

Buxus sempervirens is an evergreen shrub or small tree growing to 1–9 m (3 ft 3 in–29 ft 6 in) tall, with a trunk up to 20 centimetres (7.9 in) in diameter (exceptionally to 10 m tall and 45 cm diameter*[6]). Arranged in opposite pairs along the stems, the leaves are green to yellow-green, oval, 1.5–3 cm long, and 0.5–1.3 cm broad. The hermaphrodite flowers are inconspicuous but highly scented, greenish-yellow, with no petals, and are insect pollinated; the fruit is a three-lobed capsule containing 3-6 seeds.*[1]*[3]

13.2 Distribution and habitat

The species typically grows on soils derived from chalk, limestone, usually as an understorey in forests of larger trees, most commonly associated with *Fagus sylvatica* forests, but also sometimes in open dry montane scrub, particularly in the Mediterranean region. Box Hill, Surrey is named after its notable box population, which comprises the largest area of native box woodland in England.*[7]*[8]

The species is locally naturalised in parts of North America.*[9]

13.3 Cultivation

In Britain, three burials of the Roman era featured coffins lined with sprays of the evergreen box, a practice unattested elsewhere in Europe.*[10]

Box remains a very popular ornamental plant in gardens, being particularly valued for topiary and hedges because of its small leaves, evergreen nature, tolerance of close shearing, and scented foliage. The scent is not to everyone's liking: the herbalist John Gerard found it "evill and lothsome" and at Hampton Court Palace Queen Anne had box hedging grubbed up because the odor was offensive, Daniel Defoe tells.*[11]

Several cultivars have been selected, including 'Argenteo-variegata' and 'Marginata' with variegated foliage; such "gilded box" received a first notice in John Parkinson's *Paradisi in Sole Paradisus Terrestris* (1629).*[12] 'Vardar Valley', a slow-growing particularly hardy semi-dwarf cultivar,*[13]*[14] was selected in 1935 by the American botanist Edward Anderson in the upper Vardar valley and sent to the Arnold Arboretum for evaluation.*[15]

The following varieties and cultivars have gained the Royal Horticultural Society's Award of Garden Merit:-

Box topiary in the garden of Alden Biesen Castle, Belgium

- *B. sempervirens* 'Elegantissima'[*][16]
- *B. sempervirens* 'Latifolia Maculata'[*][17]

13.4 Timber

Slow growth of box renders the wood ("boxwood") very hard (possibly the hardest in Europe) and heavy, and free of grain produced by growth rings, making it ideal for cabinet-making, the crafting of clarinets, engraving, marquetry, woodturning, tool handles, mallet heads and as a substitute for ivory. The noted English engraver Thomas Bewick pioneered the use of boxwood blocks for engraving.[*][3][*][14][*][18]

13.5 Other uses

The leaves were formerly used in place of quinine, and as a fever reducer.[*][18]

- Foliage
- Flowers
- Bark of *B. sempervirens* 'Arborescens'
- Plant growing in dry Mediterranean scrub
- Cuttings

13.6 See also

- Boxwood blight

13.7 References

[1] Rushforth, K. (1999). *Trees of Britain and Europe*. Collins ISBN 0-00-220013-9.

[2] Flora Europaea: *Buxus sempervirens*

[3] British Trees: *Buxus sempervirens*

[4] GRIN Taxonomy for Plants – *Buxus sempervirens*

[5] Med-Checklist: *Buxus colchica*

[6] Tree Register of the British Isles

[7] Mitchell, A. F. (1974). *A Field Guide to the Trees of Britain and Northern Europe*. Collins ISBN 0-00-212035-6

[8] Bean, W. J. (1976). *Trees and Shrubs Hardy in the British Isles* 8th ed., vol. 1. John Murray ISBN 0-7195-1790-7.

[9] "PLANTS Profile". Retrieved 2007-03-14.

[10] H. Goodwin, *History of the British Flora* (1956) noted in Alice M. Coats, *Garden Shrubs and Their Histories* (1964) 1992, *s.v.* "Buxus".

[11] Defoe, *A Tour Thro' the Whole Island of Great Britain* (1724), noted in Todd Longstaffe-Gowan and Vivian Russell, *The Gardens and Parks at Hampton Court Palace* (2005:87); the authors suggest that simplification of the fussy Dutch designs to suit an English taste for plain lawn and gravel was actually the major motive (pp 84ff).

[12] Parkinson asserts in his *Theatrum Botanicum* (1640) that the "gilded" box "hath not been mentioned by any Writer before me": quoted in Alice M. Coats, *Garden Shrubs and Their Histories* (1964) 1992, *s.v.* "Buxus".

[13] Huxley, A., ed. (1992). *New RHS Dictionary of Gardening*. Macmillan ISBN 0-333-47494-5.

[14] Plants for a Future: *Buxus sempervirens*

[15] John L. Creech, note in Coats 1992.

[16] "RHS Plant Selector - *Buxus sempervirens* 'Elegantissima'". Retrieved 13 June 2013.

[17] "RHS Plant Selector - *Buxus sempervirens* 'Latifolia Maculata'". Retrieved 13 June 2013.

[18] Pg.171, Lawrence, E., ed. (1985) *The Illustrated Book of Trees & Shrubs*. Gallery Books ISBN 0-8317-8820-8.

Chapter 14

Cherry

This article is about the fruit. For other uses, see Cherry (disambiguation).
For the species called "wild cherry" in the British Isles, see Prunus avium. For other uses, see Wild Cherry.
"Cherry tree" redirects here. For other uses of "Cherry tree" or "Cherrytree", see Cherry tree (disambiguation).
A **cherry** is the fruit of many plants of the genus *Prunus*, and is a fleshy drupe (stone fruit).

The cherry fruits of commerce are usually obtained from a limited number of species such as cultivars of the sweet cherry, *Prunus avium*. The name 'cherry' also refers to the cherry tree, and is sometimes applied to almonds and visually similar flowering trees in the genus *Prunus*, as in "ornamental cherry", "cherry blossom", etc. **Wild Cherry** may refer to any of the cherry species growing outside of cultivation, although *Prunus avium* is often referred to specifically by the name "wild cherry" in the British Isles.

14.1 Botany

Many cherries are members of the subgenus ***Cerasus***, which is distinguished by having the flowers in small corymbs of several together (not singly, nor in racemes), and by having smooth fruit with only a weak groove or none along one side. The subgenus is native to the temperate regions of the Northern Hemisphere, with two species in America, three in Europe, and the remainder in Asia. Other cherry fruits are members of subgenus *Padus*. Cherry trees with low exposure to light tend to have a bigger leaf size so they can intercept all light possible. Cherry trees with high exposure to light tend to have thicker leaves to concentrate light and have a higher photosynthetic capacity.*[1]

Most eating cherries are derived from either *Prunus avium*, the **sweet cherry** (also called the **wild cherry**), or from *Prunus cerasus*, the **sour cherry**.

14.2 History

14.2.1 Etymology and antiquity

The indigenous range of the sweet cherry extends through most of Europe, western Asia and parts of northern Africa, and the fruit has been consumed throughout its range since prehistoric times. A cultivated cherry, as well as the apricot, is recorded as having been brought to Rome by Lucius Licinius Lucullus from northeastern Anatolia, also known as the Pontus region, historic Armenia, in 72 BC.*[2]

A form of cherry was introduced into England at Teynham, near Sittingbourne in Kent by order of Henry VIII, who had tasted them in Flanders.*[3]*[4]*[5]

The English word cherry, French *cerise*, Spanish *cereza*, and Turkish *kiraz* all derive from the classical Greek (κέρασος) through the Latin *cerasum*, which referred to the ancient Greek place name *Cerasus*, today the city of Giresun in northern Turkey in the ancient Pontus region, from which the cherry was first exported to Europe.*[6] The ancient Greek word κερασός "cherry" itself is thought to be derived from a pre-Greek Anatolian language.*[7]

Prunus avium*, sweet cherry, also called wild cherry*

14.3 Wildlife value

Cherry trees also provide food for the caterpillars of several Lepidoptera (moths and butterflies).

14.4 Cultivation

The cultivated forms are of the species sweet cherry (*P. avium*) to which most cherry cultivars belong, and the sour cherry (*P. cerasus*), which is used mainly for cooking. Both species originate in Europe and western Asia; they do not cross-pollinate. Some other species, although having edible fruit, are not grown extensively for consumption, except in northern regions where the two main species will not grow. Irrigation, spraying, labor, and their propensity to damage from rain and hail make cherries relatively expensive. Nonetheless, demand is high for the fruit. In commercial production, cherries are harvested by using a mechanized 'shaker'.*[8] Hand picking is also widely used to harvest the fruit to avoid damage to both fruit and trees.

Prunus cerasus

Ripe cherries of Tehran in the middle of June.

14.4.1 Growing season

Cherries have a very short growing season and can grow in most temperate latitudes. The peak season for cherries is in the summer. In Australia and New Zealand they are usually at their peak in late December, in southern Europe in June, in North America in June, in south British Columbia (Canada) in July to mid-August and in the UK in mid-July.

In many parts of North America, they are among the first tree fruits to ripen, while in Australia and New Zealand cherries are widely associated with Christmas.[*][9]

'Kordia' is an early variety which ripens during the beginning of December, 'Lapins peak' ripens near the end of December, and 'Sweethearts' finish slightly later in the Southern Hemisphere.

Like most temperate-latitude trees, cherry seeds require exposure to cold to germinate (a mechanism the tree evolved to prevent germination during the autumn, which would then result in the seedling being killed by winter temperatures). The pits are planted in the autumn (after first being chilled) and seedlings emerge in the spring. A cherry tree will take three to four years to produce its first crop of fruit, and seven years to attain full maturity. Because of the cold-weather requirement, none of the *Prunus* family can grow in tropical climates.

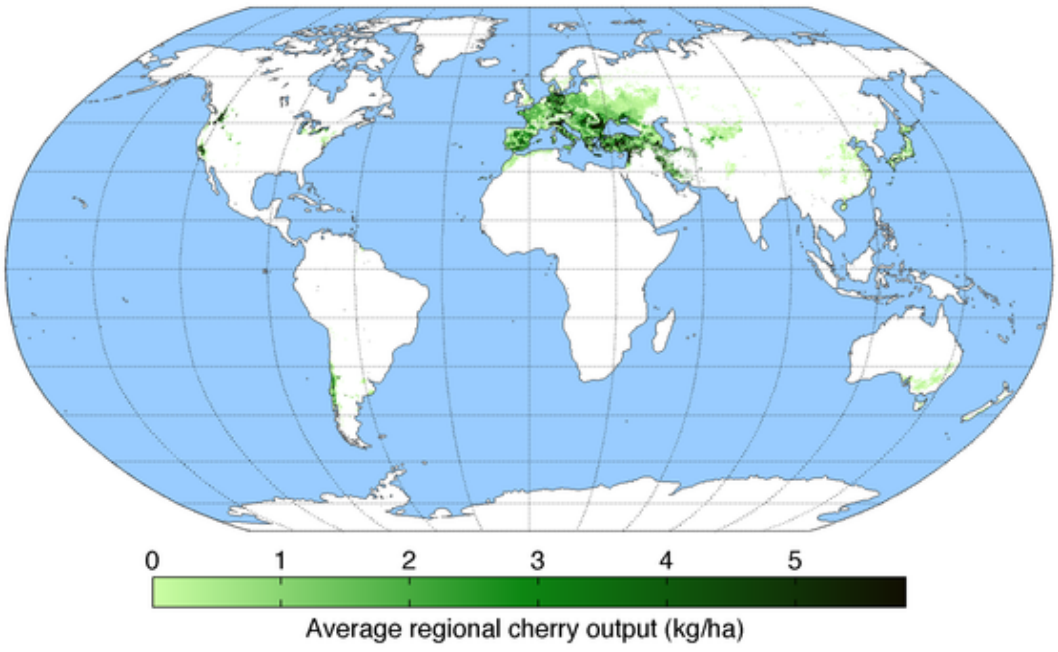
14.5 Cultivars

The following cultivars have gained the Royal Horticultural Society's Award of Garden Merit:

14.6 Ornamental trees

See cherry blossom and *Prunus*.

14.7 Commercial production



Worldwide cherry yield

14.7.1 Asia

Major commercial cherry orchards in West Asia are in Turkey (mainly Anatolia), Iran, Uzbekistan, Lebanon (Bekaa Valley), Syria (Golan Heights) and Israel (Golan Heights, Gush Eztion and Northern Galilee).

Cherries

14.7.2 Europe

Major commercial cherry orchards in Europe are in Italy and Spain and other mediterranean regions, and to a smaller extent in the Baltic States and southern Scandinavia.

In France since the 1920s, the first cherries of the season always come in March from the region of Céret (Pyrénées-Orientales),[*] [35] where the local producers always send, as a tradition since 1932, the first crate of cherries to the

French president of the Republic.*[36]

14.7.3 North America

Cherries imported from USA in Australian supermarket

In the United States, most sweet cherries are grown in Washington, California, Oregon, Wisconsin, and Michigan.*[37] Important sweet cherry cultivars include 'Bing', 'Brooks', 'Tulare', 'King', 'Sweetheart',*[38] and 'Rainier'. In addi-

tion, the 'Lambert' variety is grown on the eastern side of Flathead Lake in northwestern Montana.*[39] Both Oregon and Michigan provide light-colored 'Royal Ann' ('Napoleon'; alternately 'Queen Anne') cherries for the maraschino cherry process. Most sour (also called tart) cherries are grown in Michigan, followed by Utah, New York, and Washington.*[37] Sour cherries include 'Nanking' and 'Evans'. Traverse City, Michigan claims to be the "Cherry Capital of the World", hosting a National Cherry Festival and making the world's largest cherry pie. The specific region of northern Michigan known for tart cherry production is referred to as the "Traverse Bay" region.

Native and non-native sweet cherries grow well in Canada's provinces of Ontario and British Columbia where an annual cherry fiesta has been celebrated for 66 consecutive years (including 2014) in the Okanagan Valley town of Osoyoos.*[40] In addition to the Okanagan, other British Columbia cherry growing regions are the Similkameen Valley and Kootenay Valley, all three regions together producing 5.5 million kg annually or 60% of total Canadian output.*[41] Sweet cherry varieties in British Columbia include Rainier, Van, Chelan, Lapin, Sweetheart, Skeena, Staccato, Christalina and Bing.

14.7.4 Australia

In Australia, cherries are grown in all the states except for the Northern Territory. The major producing regions are located in the temperate areas within New South Wales, Victoria, South Australia and Tasmania. Western Australia has limited production in the elevated parts in southwest of the state. Key production areas include Young, Orange and Bathurst in New South Wales, Wandin, the Goulburn and Murray valley areas in Victoria, the Adelaide Hills region in South Australia, and the Huon and Derwent Valleys in Tasmania.

Key commercial varieties in order of seasonality include 'Empress', 'Merchant', 'Supreme', 'Ron's seedling', 'Chelan', 'Ulster', 'Van', 'Bing', 'Stella', 'Nordwunder', 'Lapins', 'Simone', 'Regina', 'Kordia' and 'Sweetheart'. New varieties are being introduced, including the late season 'Staccato' and early season 'Sequoia'. The Australian Cherry Breeding program is developing a series of new varieties which are under testing evaluation.*[42]

The New South Wales town of Young is called the "Cherry Capital of Australia" and hosts the National Cherry Festival.

14.8 Nutritional value

As raw fruit, sweet cherries provide little nutrient content per 100 g serving (nutrient table). Dietary fiber and vitamin C are present in the most significant content while other vitamins and dietary minerals each supply less than 10% of the Daily Value (DV) per serving, respectively.*[43]

Compared to sweet cherries, raw sour cherries contain higher content per 100 g of vitamin C (12% DV) and vitamin A (8% DV).*[44]

14.9 Other information

The wood of some cherry species is especially esteemed for the manufacture of fine furniture.*[45]

14.10 Species

The list below contains many *Prunus* species that bear the common name cherry, but they are not necessarily members of the subgenus *Cerasus*, or bear edible fruit. For a complete list of species, see *Prunus*. Some common names listed here have historically been used for more than one species, e.g. "rock cherry" is used as an alternative common name for both *P. prostrata* and *P. mahaleb* and "wild cherry" is used for several species.

- *Prunus apetala* (Siebold & Zucc.) Franch. & Sav. - clove cherry
- *Prunus avium* (L.) L. - sweet cherry, wild cherry, mazzard or gean
- *Prunus campanulata* Maxim. - Taiwan cherry, Formosan cherry or bell-flowered cherry

- *Prunus canescens* Bois. - grey-leaf cherry
- *Prunus caroliniana* Aiton - Carolina laurel cherry or laurel cherry
- *Prunus cerasoides* D. Don. - wild Himalayan cherry
- *Prunus cerasus* L. - sour cherry
- *Prunus cistena* Koehne - purple-leaf sand cherry
- *Prunus cornuta* (Wall. ex Royle) Steud. - Himalayan bird cherry
- *Prunus cuthbertii* Small - Cuthbert cherry
- *Prunus cyclamina* Koehne - cyclamen cherry or Chinese flowering cherry
- *Prunus dawyckensis* Sealy - Dawyck cherry
- *Prunus dielsiana* C.K. Schneid. - tailed-leaf cherry
- *Prunus emarginata* (Douglas ex Hook.) Walp. - Oregon cherry or bitter cherry
- *Prunus eminens* Beck - German: *mittlere Weichsel* (semisour cherry)
- *Prunus fruticosa* Pall. - European dwarf cherry, dwarf cherry, Mongolian cherry or steppe cherry
- *Prunus gondouinii* (Poit. & Turpin) Rehder - duke cherry
- *Prunus grayana* Maxim. - Japanese bird cherry or Gray's bird cherry
- *Prunus humilis* Bunge - Chinese plum-cherry or humble bush cherry
- *Prunus ilicifolia* (Nutt. ex Hook. & Arn.) Walp. - hollyleaf cherry, evergreen cherry, holly-leaved cherry or islay
- *Prunus incisa* Thunb. - Fuji cherry
- *Prunus jamasakura* Siebold ex Koidz. - Japanese mountain cherry or Japanese hill cherry
- *Prunus japonica* Thunb. - Korean cherry
- *Prunus laurocerasus* L. - cherry laurel
- *Prunus lyonii* (Eastw.) Sarg. - Catalina Island cherry
- *Prunus maackii* Rupr. - Manchurian cherry or Amur chokecherry
- *Prunus mahaleb* L. - Saint Lucie cherry, rock cherry, perfumed cherry or mahaleb cherry
- *Prunus maximowiczii* Rupr. - Miyama cherry or Korean cherry
- *Prunus mume* (Siebold & Zucc.) - Chinese plum or Japanese apricot
- *Prunus myrtifolia* (L.) Urb. - West Indian cherry
- *Prunus nepaulensis* (Ser.) Steud. - Nepal bird cherry
- *Prunus nipponica* Matsum. - Takane cherry, peak cherry or Japanese alpine cherry
- *Prunus occidentalis* Sw. - western cherry laurel
- *Prunus padus* L. - bird cherry or European bird cherry
- *Prunus pensylvanica* L.f. - pin cherry, fire cherry, or wild red cherry
- *Prunus pleuradenia* Griseb. - Antilles cherry
- *Prunus prostrata* Labill. - mountain cherry, rock cherry, spreading cherry or prostrate cherry
- *Prunus pseudocerasus* Lindl. - Chinese sour cherry or false cherry

- *Prunus pumila* L. - sand cherry
- *Prunus rufa* Wall ex Hook.f. - Himalayan cherry
- *Prunus salicifolia* Kunth. - capulin, Singapore cherry or tropic cherry
- *Prunus sargentii* Rehder - Sargent's cherry
- *Prunus serotina* Ehrh. - black cherry, wild cherry
- *Prunus serrula* Franch. - paperbark cherry, birch bark cherry or Tibetan cherry
- *Prunus serrulata* Lindl. - Japanese cherry, hill cherry, Oriental cherry or East Asian cherry
- *Prunus speciosa* (Koidz.) Ingram - Oshima cherry
- *Prunus ssiori* Schmidt- Hokkaido bird cherry
- *Prunus stipulacea* Maxim.
- *Prunus subhirtella* Miq. - Higan cherry or spring cherry
- *Prunus takesimensis* Nakai - Takeshima flowering cherry
- *Prunus tomentosa* Thunb. - Nanking cherry, Manchu cherry, downy cherry, Shanghai cherry, Ando cherry, mountain cherry, Chinese dwarf cherry, Chinese bush cherry
- *Prunus verecunda* (Koidz.) Koehne - Korean mountain cherry
- *Prunus virginiana* L. - chokecherry
- *Prunus x yedoensis* Matsum. - Yoshino cherry or Tokyo cherry

14.11 See also

- Cherry pitter
- Dried cherry
- List of AGM flowering cherries

14.12 Notes

[1] Goncalves, Berta; Carlos M. Correia; Ana Paula Silva; Eunice A. Bacelar; Alberto Santos; José M. Moutinho-Pereira (20 May 2008). "Leaf structure and function of sweet cherry tree (Prunus avium L.) cultivars with open and dense canopies". *Scientia Horticulturae*. Scientia Horticulturae **116** (4): 381–387. doi:10.1016/j.scienta.2008.02.013.

[2] "Pontus". *Catholic Encyclopedia*. New York: Robert Appleton Company. 1913.

[3] The curious antiquary John Aubrey (1626–1697) noted in his memoranda: "Cherries were first brought into Kent tempore H. viii, who being in Flanders, and likeing the Cherries, ordered his Gardener, brought them hence, and propagated them in England." Oliver Lawson Dick, ed. (1949). Aubrey's Brief Lives. Edited from the Original Manuscripts. p. xxxv.

[4] "All the cherry gardens and orchards of Kent are said to have been stocked with the Flemish cherry from a plantation of 105 acres in Teynham, made with foreign cherries, pippins [pippin apples], and golden rennets [goldreinette apples], done by the fruiterer of Henry VIII." (Kent On-line: Teynham Parish)

[5] The civic coat of arms of Sittingbourne with the crest of a "cherry tree fructed proper" and motto "known by their fruits" were only granted on July 28, 1949, however.

[6] *A History of the Vegetable Kingdom*, Page 334.

[7] Robert S. P. Beekes (2010). *Etymological Dictionary of Greek*. Brill. ISBN 978-90-04-17418-4. As the improved cherry came from the Pontos area (cf. Κερασοῦς "rich in cherries", town on the Pontos), the name is probably Anatolian as well. Given its intervocalic σ, the form must be Anatolian or Pre-Greek. For the suffix, cf. ▶-θίασος, ▶-κάρπασος, which too are of foreign origin. Assyr. karšu has also been adduced. Cf. on ▶κράνον 'cornelian cherry'. Gr. κέρασος, -ία, κεράσιον were borrowed into many languages: Asiatic names of the cherry-tree and the cherry, like Arm. keřas, Kurd. ghilas, and in the West, Lat. cerasus, -ium, VLat. ★cerasia, ★ceresia, -ea; from Latin came the Romance and Germanic forms like MoFr. cerise, OHG chirsa > Kirsche. Lit.: Olck in PW 11: 509f. and Hester Lingua 13 (1965): 356.

[8] Chainpure (2009-06-23). "Soul to Brain: Wow! Its Cherry Harvesting". Chainpure.com. Retrieved 2011-11-26.

[9] Footner, Regan (27 November 2008). "Cherries - a sign of Christmas". *ABC Blogs*. Retrieved 29 January 2013.

[10] "RHS Plant Selector Prunus 'Accolade' (d) AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2012-11-11.

[11] "RHS Plant Selector Prunus 'Amanogawa' AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2012-11-11.

[12] "RHS Plant Selector Prunus × subhirtella 'Autumnalis' AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2012-11-11.

[13] "RHS Plant Selector Prunus × subhirtella 'Autumnalis Rosea' AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2012-11-11.

[14] "RHS Plant Selector Prunus padus 'Colorata' AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2012-11-11.

[15] "RHS Plant Selector Prunus 'Kanzan' AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2012-11-11.

[16] "RHS Plant Selector Prunus 'Kiku-shidare-zakura' AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2012-11-11.

[17] "RHS Plant Selector Prunus 'Kursar' AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2012-11-11.

[18] "RHS Plant Selector Prunus cerasus 'Morello' (C) AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2012-11-11.

[19] "RHS Plant Selector Prunus × incam 'Okamé' AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2012-11-11.

[20] "RHS Plant Selector Prunus 'Pandora' AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2012-11-11.

[21] "RHS Plant Selector Prunus pendula 'Pendula Rosea' AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2012-11-11.

[22] "RHS Plant Selector Prunus pendula 'Pendula Rubra' AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2012-11-11.

[23] "RHS Plant Selector Prunus 'Pink Perfection' AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2012-11-11.

[24] "RHS Plant Selector Prunus avium 'Plena' (d) AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2012-11-11.

[25] "RHS Plant Selector Prunus avium 'Stella' (F) AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2012-11-11.

[26] "RHS Plant Selector Prunus × cistena AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2012-11-11.

[27] "RHS Plant Selector Prunus sargentii AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2012-11-11.

[28] "RHS Plant Selector Prunus serrula AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2012-11-11.

[29] "RHS Plant Selector Prunus 'Shirofugen' AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2012-11-11.

[30] "RHS Plant Selector Prunus 'Shirotae' AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2012-11-11.

[31] "RHS Plant Selector - *Prunus* 'Shogetsu'". Retrieved 29 May 2013.

[32] "RHS Plant Selector - *Prunus* 'Spire'". Retrieved 29 May 2013.

[33] "RHS Plant Selector - *Prunus* 'Ukon'". Retrieved 29 May 2013.

[34] "Production of Cherry by countries". UN Food & Agriculture Organization. 2012. Retrieved 2014-09-14.

[35] (French) Fabricio Cardenas, Vieux papiers des Pyrénées-Orientales, *Premières cerises de Céret et d'ailleurs*, August 24, 2014

[36] (French) Fabricio Cardenas, Vieux papiers des Pyrénées-Orientales, *Des cerises de Céret pour le président de la République en 1932*, June 1st 2014

[37] Cherry Production (PDF) (Report). National Agricultural Statistics Service, USDA. June 23, 2011. ISSN 1948-9072. Retrieved 2011-10-06.

[38] "Cherry Varieties". Retrieved 24 October 2014.

[39] Sweet Cherries Of Flathead Lake, Retrieved on August 28, 2009

[40] "66th Annual Cherry Fiesta/Canada Day Celebrations". Destination Osoyoos. 2014. Retrieved 28 June 2014.

[41] "Cherries". BC Ministry of Agriculture. 2013. Retrieved 28 June 2014.

[42] "ANNUAL INDUSTRY REPORT 08 • 09" (PDF). Horticulture Australia Limited (HAL).

[43] "Nutrition facts, cherries, sweet, raw, 100 g". *US Department of Agriculture National Nutrient Database, Standard Reference 21*. Nutritiondata.com. Retrieved 19 February 2013.

[44] "Nutrition facts, cherries, sour, red, raw, 100 g". *US Department of Agriculture National Nutrient Database, Standard Reference 21*. Nutritiondata.com. Retrieved 19 February 2013.

[45] *Encyclopedia Britannica*. 1994–2009.

14.13 External links

- "Cherry". *The American Cyclopædia*. 1879.

Chapter 15

Plum

For other uses, see Plum (disambiguation).

A **plum** is a fruit of the subgenus *Prunus* of the genus *Prunus.* The subgenus is distinguished from other subgenera (peaches, cherries, bird cherries, etc.) in the shoots having a terminal bud and solitary side buds (not clustered), the flowers in groups of one to five together on short stems, and the fruit having a groove running down one side and a smooth stone (or *pit*).

Mature plum fruit may have a dusty-white coating that gives them a glaucous appearance. This is an epicuticular wax coating and is known as "wax bloom". Dried plum fruits are called **dried plums** or **prunes**, although prunes are a distinct type of plum, and may have antedated the fruits now commonly known as plums.

15.1 Description

Plums are a diverse group of species. The commercially important plum trees are medium-sized, usually pruned to 5–6 meters height. The tree is of medium hardiness.*[2] Without pruning, the trees can reach 12 meters in height and spread across 10 meters. They blossom in different months in different parts of the world; for example, in about January in Taiwan and early April in the United Kingdom.*[3]

Fruits are usually of medium size, between 1 to 3 inches in diameter, globose to oval. The flesh is firm and juicy. The fruit's peel is smooth, with a natural waxy surface that adheres to the flesh. The plum is a drupe, meaning its fleshy fruit surrounds a single hard seed.

15.2 Species

Plum has many species, and taxonomists differ on the count. Depending on the taxonomist, between 19 to 40 species of plum exist. From this diversity only two species, the hexaploid European plum (*Prunus domestica*) and the diploid Japanese plum (*Prunus salicina* and hybrids), are of worldwide commercial significance. The origin of these commercially important species is uncertain but may have involved P. cerasifera and possibly P. spinosa as ancestors. Other species of plum variously originated in Europe, Asia and America.*[4]

The subgenus *Prunus* is divided into three sections:

- Sect. *Prunus* (Old World plums)- leaves in bud rolled inwards; flowers 1-3 together; fruit smooth, often wax-bloomed

-
  - *P. cerasifera* (cherry plum)
  - *P. cocomilia* (Italian plum)
  - *P. consociiflora*
  - *P. domestica* (species of most "plums" and "prunes")

Prunus *cultivar (mature fruits with natural wax bloom)*

Plum flowers

- *P. domestica ssp. insititia* (damsons, bullaces)
- *P. simonii* (widely cultivated in North China)*[5]
- *P. spinosa* (blackthorn or sloe)

- Sect. *Prunocerasus* (New World plums) - leaves in bud folded inwards; flowers 3-5 together; fruit smooth, often wax-bloomed

-
  - *P. alleghaniensis* (Allegheny plum)
  - *P. americana* (American plum)
  - *P. angustifolia* (Chickasaw plum)
  - *P. hortulana*
  - *P. maritima* (beach plum)
  - *P. mexicana* (Mexican plum)
  - *P. nigra* (Canada plum, Black plum)
  - *P.* × *orthosepala* (*P. americana* × *P. angustifolia)*
  - *P. subcordata* (Klamath, Oregon, or Sierra plum)

- Sect. *Armeniaca* (apricots) - leaves in bud rolled inwards; flowers very short-stalked; fruit velvety; treated as a distinct subgenus by some authors

-
  - *P. armeniaca* (apricot)
  - *P. brigantina*
  - *P. mandshurica*
  - *P. mume* (Chinese plum, Japanese apricot)
  - *P. sibirica* (Siberian apricot)

15.3 Cultivation and uses

The taste of the plum fruit ranges from sweet to tart; the skin itself may be particularly tart. It is juicy and can be eaten fresh or used in jam-making or other recipes. Plum juice can be fermented into plum wine. In central England, a cider-like alcoholic beverage known as plum jerkum is made from plums.

Dried plums (or prunes) are also sweet and juicy and contain several antioxidants. Plums and prunes are known for their laxative effect. This effect has been attributed to various compounds present in the fruits, such as dietary fiber, sorbitol,*[6] and isatin.*[7] Prunes and prune juice are often used to help regulate the functioning of the digestive system. Dried prune marketers in the USA have, in recent years, begun marketing their product as "dried plums". This is due to "prune" having negative connotations connected with elderly people suffering from constipation.*[8]

Dried, salted plums are used as a snack, sometimes known as *saladito* or *salao*. Various flavors of dried plum are available at Chinese grocers and specialty stores worldwide. They tend to be much drier than the standard prune. Cream, ginsing, spicy, and salty are among the common varieties. Licorice is generally used to intensify the flavor of these plums and is used to make salty plum drinks and toppings for shaved ice or *baobing*.

Different cultivars of plums

Damson plums

Cultivar Regina Claudia yellow

Greengage plums

Mirabelle plums

Victoria plums

Pickled plums are another type of preserve available in Asia and international specialty stores. The Japanese variety, called *umeboshi*, is often used for rice balls, called *onigiri* or *omusubi*. The *ume*, from which *umeboshi* are made, is more closely related, however, to the apricot than to the plum.

As with many other members of the rose family, plum seeds contain cyanogenic glycosides, including amygdalin.*[9] These substances are capable of decomposing into a sugar molecule and hydrogen cyanide gas. While plum seeds are not the most toxic within the rose family (the bitter almond is the most toxic), large doses of these chemicals from any source are hazardous to human health.

Prune kernel oil is made from the fleshy inner part of the pit of the plum.

Plums come in a wide variety of colors and sizes. Some are much firmer-fleshed than others, and some have yellow, white, green or red flesh, with equally varying skin color.

Though not available commercially, the wood of plum trees is used by hobbyists and other private woodworkers for musical instruments, knife handles, inlays, and similar small projects.*[10]

Plum cultivars in use today include:

- Damson (purple or black skin, green flesh, clingstone, astringent)
- Greengage (firm, green flesh and skin even when ripe)
- Mirabelle (dark yellow, predominantly grown in northeast France)
- Satsuma plum (firm red flesh with a red skin)
- Victoria (yellow flesh with a red or mottled skin)
- Yellowgage or golden plum (similar to greengage, but yellow)

When it flowers in the early spring, a plum tree will be covered in blossoms, and in a good year approximately 50% of the flowers will be pollinated and become plums. Flowering starts after 80 growing degree days.

If the weather is too dry, the plums will not develop past a certain stage, but will fall from the tree while still tiny, green buds, and if it is unseasonably wet or if the plums are not harvested as soon as they are ripe, the fruit may develop a fungal condition called brown rot. Brown rot is not toxic, and very small affected areas can be cut out of the fruit, but unless the rot is caught immediately, the fruit will no longer be edible. Plum is used as a food plant by the larvae of some Lepidoptera, including November moth, willow beauty and short-cloaked moth.

The Serbian plum (Serbian: шљива / *šljiva*) is the third most produced in the world. In the Balkans, plum is converted into an alcoholic drink named *slivovitz* (plum brandy) (Serbian: шљивовица / *šljivovica*).*[11]*[12]

A large number of plums, of the Damson variety, are also grown in Hungary, where they are called *szilva* and are used to make *lekvar* (a plum paste jam), *palinka* (traditional fruit brandy), plum dumplings, and other foods. The region of Szabolcs-Szatmár, in the northeastern part of the country near the borders with Ukraine and Romania, is a major producer of plums.

The plum blossom or *meihua* (Chinese: 梅花; pinyin: *méihuā*), along with the peony, are considered traditional floral emblems of China.

The plum is commonly used in China, Yunnan area, to produce a local plum wine with a smooth, sweet, fruity taste and approximately 12% alcohol by volume.

15.4 History

Plums may have been one of the first fruits domesticated by humans.*[13] Three of the most abundant cultivars are not found in the wild, only around human settlements: *Prunus domestica* has been traced to East European and Caucasian mountains, while *Prunus salicina* and *Prunus simonii* originated in Asia. Plum remains have been found in Neolithic age archaeological sites along with olives, grapes and figs.*[14]*[15]

A plum tree

15.5 Etymology and names

The fruit *Prunus armeniaca* gained its name from the beliefs of Pliny the Elder, a Roman historian and scientist of the first century, who maintained the apricot was a kind of a plum, and had originally come from Armenia.*[16] Armenian sources support their claims by referring to a 6,000-year-old apricot pit found in an archaeological site near Yerevan.*[16] Other historians point to Mesopotamia as a clue to the Latin name. Apricots were cultivated in Mesopotamia, and it was known as *armanu* in the Akkadian language, but this did not refer to Armenia as that is not the name by which that geographic region was known in the Akkadian language. It is likely that Pliny's explanation is a folk etymology based on the similarity between the Mesopotamian name for the fruit and the Latin name for Armenia.

In certain parts of the world, some fruits are called plums and are quite different from fruits known as plums in Europe or the Americas. For example, marian plums are popular in Thailand, Malaysia and Indonesia, otherwise also known as *gandaria*, *plum mango*, *ma-praang*, *ma-yong*, *ramania*, *kundang*, *rembunia* or *setar*.*[18] Another example is the Japanese plum, popular as *pipa* or Chinese plums in East Asia and Southeast Asia, and as Japanese medlar, *loquat*, *nispero*, *bibassier* and *wollmispel* elsewhere.*[19]*[20] In South Asia and Southeast Asia, Jambul - a fruit from tropical tree in Myrtaceae family, is similarly sometimes referred to 'damson plums', and it is different from damson plums found in Europe and Americas.*[21] Jambul is also called as Java plum, Malabar plum, *jaman*, *jamun*, *jamblang*, *jiwat*, *salam*, *duhat*, *koeli*, *jambuláo* or *koriang*.

15.6 Production

Plums are produced around the world, and China is the world's largest producer. The table below shows the ten largest producers of plums and sloe in 2011; the second to tenth rankings change almost every year due in part to the alternate bearing nature of plum trees.

In the United States, the Japanese varieties of plums are predominant. California was the dominant producer in 2011; other producers are Oregon, Washington, Idaho and Michigan. Mild winters, minimal rainfall during the growing season and low humidity favor more productive crops in California.*[22]

15.7 See also

- Fruit tree
- Fruit tree forms
- Fruit tree propagation
- Fruit tree pruning
- Lemon Plum
- List of plum dishes
- Pluot

15.8 References

[1] D. Potter, T. Eriksson, R. C. Evans, S. Oh, J. E. E. Smedmark, D. R. Morgan, M. Kerr, K. R. Robertson, M. Arsenault, T. A. Dickinson & C. S. Campbell (2007). "Phylogeny and classification of Rosaceae" (PDF). *Plant Systematics and Evolution* **266** (1–2): 5–43. doi:10.1007/s00606-007-0539-9. Note that this publication pre-dates the 2011 International Botanical Congress which mandates that the combined subfamily referred to in the paper as Spiraeoideae must be called Amygdaloideae.

[2] "Plum, prune, European type". Purdue University. 1999.

[3] "Prunus domestica Plum, European plum PFAF Plant Database". *pfaf.org*.

[4] Bruce L. Topp, Dougal M. Russell, Michael Neumüller, Marco A. Dalbó and Weisheng Liu (2012). *Plum (Handbook of Plant Breeding)*. 8, part 3. pp. 571–621. doi:10.1007/978-1-4419-0763-9_15.

[5] "Prunus simonii in Flora of China @ efloras.org". *efloras.org*.

[6] Mary Roach. "The power of prunes". *salon.com*.

[7] "Food Network Canada - Easy Recipes & How to Cook Guides - TV Schedules". *foodnetwork.ca*.

[8] Jason Zasky. "Turning Over a New Leaf Change from 'Prune' to 'Dried Plum' Proving Fruitful". Archived from the original on 2007-10-14. Retrieved 2014-09-30.

[9] Burrows, G.E.; Tyrl, R.J. (2012). "Rosaceae Juss.". *Toxic Plants of North America*. Wiley-Blackwell. pp. 1064–1094.

[10] "Plum". *The Wood Database*.

[11] Crowell and Guymon (1973). "Aroma Constituents of Plum Brandy". *American Journal of Enology* **24** (4): 159–165.

[12] Jan Velíšek, František Pudil, Jiří Davídek and Vladislav Kubelka (1982). "The neutral volatile components of Czechoslovak plum brandy". *ZEITSCHRIFT FÜR LEBENSMITTELUNTERSUCHUNG UND -FORSCHUNG A* **174** (6): 463–466. doi:10.1007/BF01042726.

[13] Jules Janick, ed. (1998). *Horticultural Reviews (Volume 23)*. Wiley. ISBN 978-0471254454.

[14] Jules Janick (2005). "The origins of fruits, fruit growing and fruit breeding" (PDF). Purdue University.

[15] Spangenberg et al. (January 2006). "Chemical analyses of organic residues in archaeological pottery from Arbon Bleiche". *Journal of Archaeological Science* **33** (1): 1–13. doi:10.1016/j.jas.2005.05.013.

[16] Armenian Food: Fact, Fiction & Folklore By Irina Petrosian, David Underwood

[17] "Production of Plum by countries". UN Food & Agriculture Organization. 2013. Retrieved 2015-04-20.

[18] "Under-Utilized Tropical Fruits of Thailand (see Part 1, section 3)". FAO, United Nations. 2001.

[19] "Japanese Plum - Loquat". University of Florida, Nassau County Extension, Horticulture. 2006.

[20] J. Morton (1987). "Loquat". University of Purdue.

[21] "Jambolan". Purdue University. 2006.

[22] "Plums, fresh market". AgMRC, partially funded by USDA Rural Department. 2012.

- Khanizadeh, S. and J. Cousineau. 2000. A Fully Bilingual Book Entitled "Our Plums/ Les Pruniers de Chez Nous", A Description of Over 60 Plum Cultivars Evaluated in Quebec along with Over 150 Coloured Images. Publisher Shahrokh Khanizadeh for the Department of Agriculture and Agri-Food Canada. Ed: S. Khanizadeh. ISBN 0-660-61568-1.

15.9 External links

- *Prunus americanum* images hosted by the Department of Biological Sciences of Vanderbilt University
- A horticulturist exchange for Plum trees and orchards - North Dakota University
- Plum trees - A University of Georgia exchange center
- Plum orchards information - Ministry of Agriculture, British Columbia, Canada

Chapter 16

Prunus avium

Prunus avium, commonly called **wild cherry**,[*][2] **sweet cherry**,[*][2] **bird cherry**,[*][2] or **gean**,[*][2] is a species of cherry native to Europe, Anatolia, Maghreb, and western Asia, from the British Isles[*][3] south to Morocco and Tunisia, north to the Trondheimsfjord region in Norway and east to the Caucasus and northern Iran, with a small disjunct population in the western Himalaya.[*][4][*][5] This species, in the rose family (Rosaceae), has a diploid set of sixteen chromosomes ($2n = 16$).[*][6] All parts of the plant except for the ripe fruit are slightly toxic, containing cyanogenic glycosides.

16.1 Nomenclature

Flowers

The early history of its classification is somewhat confused. In the first edition of *Species Plantarum* (1753), Linnaeus treated it as only a variety, *Prunus cerasus* var. *avium*, citing Gaspard Bauhin's *Pinax theatri botanici* (1596) as a synonym; his description, *Cerasus racemosa hortensis* ("Cherry with racemes, of gardens") shows it was described

from a cultivated plant.*[7] Linnaeus then changed from a variety to a species *Prunus avium* in the second edition of his *Flora Suecica* in 1755.*[8]

Sweet cherry was known historically as **Gean** or **Mazzard** (also 'massard'), until recently, both were largely obsolete names in modern English.

The name "wild cherry" is also commonly applied to other species of *Prunus* growing in their native habitats, particularly to the North American species *Prunus serotina*.

Prunus avium means "bird cherry" in the Latin language,*[5] but in English "bird cherry" refers to *Prunus padus*.*[9]

16.1.1 Mazzard

More recently 'Mazzard' has been used to refer to a selected self-fertile cultivar that comes true from seed, and which is used as a seedling rootstock for fruiting cultivars.*[10]*[11] This term is still used particularly for the varieties of P. avium grown in North Devon and cultivated there, particularly in the orchards at Landkey.

16.2 Description and ecology

Red glands (extrafloral nectaries) on the petiole.

Prunus avium is a deciduous tree growing to 15–32 m (50–100 ft) tall, with a trunk up to 1.5 m (5 ft) in diameter. Young trees show strong apical dominance with a straight trunk and symmetrical conical crown, becoming rounded to irregular on old trees. The bark is smooth purplish-brown with prominent horizontal grey-brown lenticels on young trees, becoming thick dark blackish-brown and fissured on old trees. The leaves are alternate, simple ovoid-acute, 7–14 cm (3–6 in) long and 4–7 cm (2–3 in) broad, glabrous matt or sub-shiny green above, variably finely downy beneath, with a serrated margin and an acuminate tip, with a green or reddish petiole 2–3.5 cm (0.8–1.4 in) long bearing two to five small red glands. The tip of each serrated edge of the leaves also bear small red glands.*[12] In autumn, the leaves turn orange, pink or red before falling. The flowers are produced in early spring at the same time as the new leaves, borne in corymbs of two to six together, each flower pendent on a 2–5 cm (0.8–2 in) peduncle, 2.5–3.5 cm (1–1.4 in) in diameter, with five pure white petals, yellowish stamens, and a superior ovary; they are

hermaphroditic, and pollinated by bees. The ovary contains two ovules, only one of the becomes the seed.*[13] The fruit is a drupe 1–2 cm (0.4–0.8 in) in diameter (larger in some cultivated selections), bright red to dark purple when mature in midsummer, edible, variably sweet to somewhat astringent and bitter to eat fresh. Each fruit contains a single hard-shelled stone 8–12 mm long, 7–10 mm wide and 6–8 mm thick, grooved along the flattest edge; the seed (kernel) inside the stone is 6–8 mm long.

The fruit are readily eaten by numerous kinds of birds and mammals, which digest the fruit flesh and disperse the seeds in their droppings. Some rodents, and a few birds (notably the Hawfinch), also crack open the stones to eat the kernel inside. All parts of the plant except for the ripe fruit are slightly toxic, containing cyanogenic glycosides.*[14]*[15]*[16]

See also List of Lepidoptera that feed on Prunus

The leaves provide food for some animals, including Lepidoptera such as the case-bearer moth *Coleophora anatipennella*.

The tree exudes a gum from wounds in the bark, by which it seals the wounds to exclude insects and fungal infections.*[17]

16.3 Cultivation and uses

16.3.1 Fruit

Main article: Cherry

Some eighteenth and nineteenth century botanical authors assumed a western Asia origin for the species based on the writings of Pliny; however, archaeological finds of seeds from prehistoric Europe contradict this view. Wild cherries have been an item of human food for several thousands of years. The stones have been found in deposits at Bronze Age settlements throughout Europe, including in Britain.*[10] In one dated example, wild cherry macrofossils were found in a core sample from the detritus beneath a dwelling at an Early and Middle Bronze Age pile-dwelling site on and in the shore of a former lake at Desenzano del Garda or Lonato, near the southern shore of Lake Garda, Italy. The date is estimated at Early Bronze Age IA, carbon dated there to 2077 BC plus or minus 10 years. The natural forest was largely cleared at that time.*[18]

By 800 BC, cherries were being actively cultivated in Asia Minor, and soon after in Greece.*[10]

As the main ancestor of the cultivated cherry, the sweet cherry is one of the two cherry species which supply most of the world's commercial cultivars of edible cherry (the other is the sour cherry *Prunus cerasus*, mainly used for cooking; a few other species have had a very small input).*[10] Various cherry cultivars are now grown worldwide wherever the climate is suitable; the number of cultivars is now very large.*[10] The species has also escaped from cultivation and become naturalised in some temperate regions, including southwestern Canada, Japan, New Zealand, and the northeast and northwest of the United States.*[5]

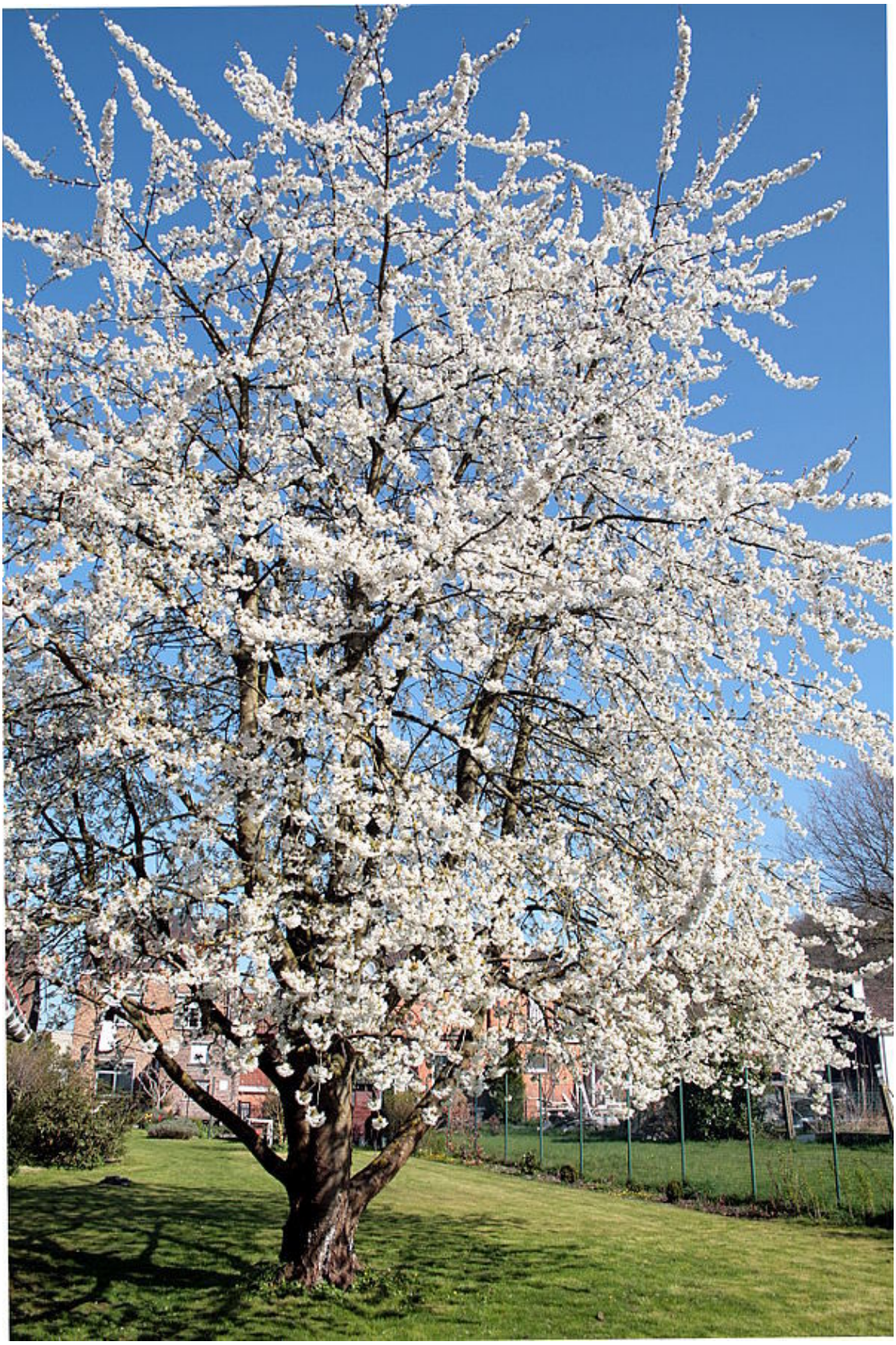
16.3.2 Ornamental

It is often cultivated as a flowering tree. Because of the size of the tree, it is often used in parkland, and less often as a street or garden tree. The double-flowered form, 'Plena', is commonly found, rather than the wild single-flowered forms.*[19]

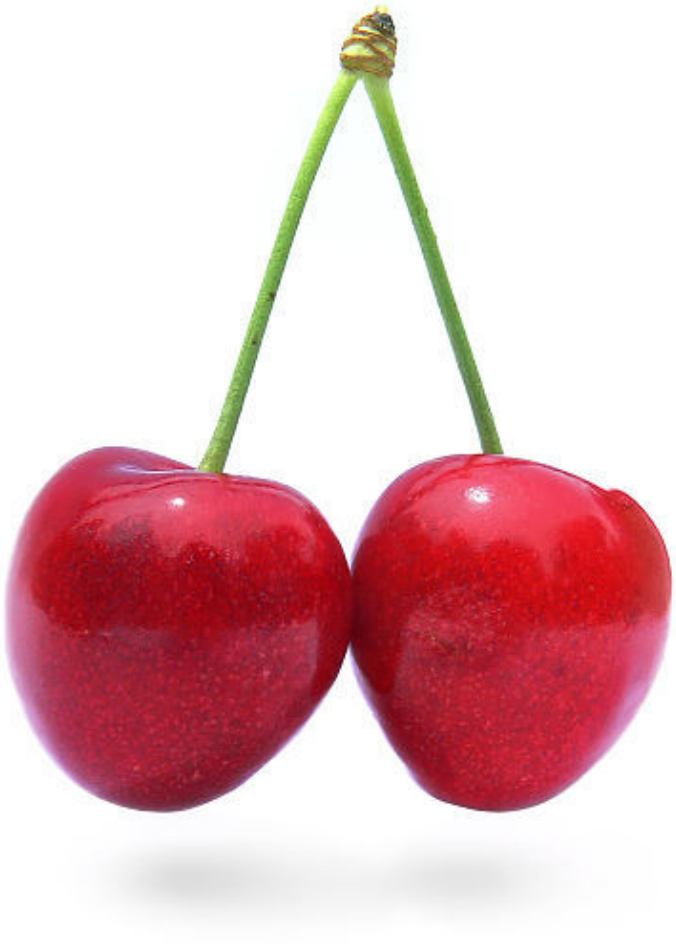
Two interspecific hybrids, *P. x schmittii* (*P. avium* x *P. canescens*) and *P. x fontenesiana* (*P. avium* x *P. mahaleb*) are also grown as ornamental trees.*[19]

16.3.3 Timber

The hard, reddish-brown wood (cherry wood) is valued as a hardwood for woodturning, and making cabinets and musical instruments.*[17] Cherry wood is also used for smoking foods, particularly meats, in North America, as it lends a distinct and pleasant flavor to the product.



Prunus avium in spring.



Pair of fruit growing from the same stem

16.3.4 Other uses

The gum from bark wounds is aromatic and can be chewed as a substitute for chewing gum.

Medicine can be prepared from the stalks of the drupes that is astringent, antitussive, and diuretic.*[11]

A green dye can also be prepared from the plant.*[11]

16.4 Contribution to other species

Prunus avium is thought to be one of the parent species of *Prunus cerasus* (sour cherry) by way of ancient crosses between it and *Prunus fruticosa* (dwarf cherry) in the areas where the two species overlap. All three species can breed with each other. *Prunus cerasus* is now a species in its own right having developed beyond a hybrid and stabilised.*[20]

16.5 Cultural history

Pliny distinguishes between *Prunus*, the plum fruit,*[21] and *Cerasus*, the cherry fruit.*[22] Already in Pliny quite a number of cultivars are cited, some possibly species or varieties, Aproniana, Lutatia, Caeciliana, and so on. Pliny grades them by flavour, including dulcis ("sweet") and acer ("sharp").*[23]

He goes so far as to say that before the Roman consul Lucius Licinius Lucullus defeated Mithridates in 74 BC, *Cerasia ... non fuere in Italia*, "There were no cherry trees in Italy" . According to him, Lucullus brought them in from Pontus and in the 120 years since that time they had spread across Europe to Britain.*[22]

Although **cultivated / domesticated** varieties of *Prunus avium* (sweet cherry) didn' t exist in Britain or much of Europe, the tree in its **wild** state is native to most of Europe, including Britain. Evidence of consumption of the wild fruits has been found as far back as the Bronze Age at a Crannog in County Offaly, in Ireland.*[24]

Seeds of a number of cherry species have however been found in Bronze Age and Roman archaeological sites throughout Europe. The reference to "sweet" and "sour" supports the modern view that "sweet" was *Prunus avium*; there are no other candidates among the cherries found. In 1882 Alphonse de Candolle pointed out that seeds of *Prunus avium* were found in the Terramare culture of north Italy (1500–1100 BC) and over the layers of the Swiss pile dwellings.*[25] Of Pliny's statement he says (p. 210):

> Since this error is perpetuated by its incessant repetition in classical schools, it must once more be said that cherry trees (at least the bird cherry) existed in Italy before Lucullus, and that the famous gourmet did not need to go far to seek the species with the sour or bitter fruit.

De Candolle suggests that what Lucullus brought back was a particular cultivar of *Prunus avium* from the Caucasus. The origin of cultivars of *P. avium* is still an open question. Modern cultivated cherries differ from wild ones in having larger fruit, 2–3 cm diameter. The trees are often grown on dwarfing rootstocks to keep them smaller for easier harvesting.*[26]

16.6 References

[1] "The Plant List: A Working List of All Plant Species" . Retrieved January 27, 2014.

[2] "USDA GRIN taxonomy" .

[3] British Trees Online

[4] Euro+Med Plantbase Project: *Prunus avium*

[5] Den Virtuella Floran: *Prunus avium* (in Swedish; with map)

[6] Tavaud, M.; Zanetto, A.; David, J.L.; Laigret, F.; Dirlewanger, E. (2004). Genetic relationships between diploid and allotetraploid cherry species (Prunus avium, Prunus xgondouinii and Prunus cerasus). *Heredity*. 93(6): 631–638.

[7] Linnaeus, C. (1753). *Species Plantarum* 1: 474. Online facsimile.

[8] Linnaeus, C. (1755). *Flora Suecica*, ed. 2: 165.

[9] Flora of NW Europe: *Prunus padus*

[10] Huxley, A., ed. (1992). *New RHS Dictionary of Gardening*. Macmillan ISBN 0-333-47494-5.

[11] Plants for a Future: *Prunus avium*

[12] "Jim Conrad's Newsletter. Cherry leaf glands" . Backyardnature.net. 2005-06-12. Retrieved 2012-04-24.

[13] http://www.pollinator.ca/bestpractices/cherries.html

[14] Rushforth, K. (1999). *Trees of Britain and Europe*. Collins ISBN 0-00-220013-9.

[15] Mitchell, A. F. (1974). *Field Guide to the Trees of Britain and Northern Europe*. Collins ISBN 0-00-212035-6.

[16] Flora of NW Europe: *Prunus avium*

[17] Vedel, H., & Lange, J. (1960). *Trees and Bushes in Wood and Hedgerow*. Metheun & Co. Ltd., London.

[18] Marinis, R. C. de, Rapi, M., Ravazzi, C., Arpenti, E., Deaddis, M., & Perego, R. (2005). Lavagnone (Desenzano del Garda): new excavations and palaeoecology of a Bronze Age pile dwelling site in northern Italy. In: DellaCasa, P. & Trachsel, M., eds. *Wetland Economies and Societies*. Proceedings of the International Conference in Zurich, 10–13 March 2004. *Collectio Archæologica* 3: 221–232 Available online (pdf file)

[19] European Garden Flora; Volume IV

[20] Stocks, Christopher (2009). "Britain's forgotten fruits". *Flora* **1**: pages 1–200.

[21] *Natural History* Book XV Section XII.

[22] Pliny. *Natural History* Book XV Section XXX.

[23] N.H. Book XV Sections XXXI–II.

[24] Milner, Edward (2011). "Trees of Britain and Ireland". *Flora* **1**: 148.

[25] Candolle, A. de (1882). *Origine des plantes cultivées*. Geneva.

[26] Panda, S., Martin, J. P., & Aquinagalde, I. (2003). Chloroplast DNA study in sweet cherry cultivars (Prunus avium L.) using PCR-RFLP method. *Genetic Resources and Crop Evolution* 50 (5): 489–495. Abstract

Chapter 17

Prunus padus

For the bird cherry subgenus *Padus*, see Prunus subg. Padus.

Not to be confused with Prunus avium, meaning "bird cherry".

Bird cherries (drupes)

Prunus padus, known as **Bird Cherry** or **Hackberry**, is a species of cherry, native to northern Europe and northern Asia. It is a deciduous small tree or large shrub, 8–16 m tall, which grows south of the Arctic Circle in northern Britain and Ireland, Norway, Sweden, Finland, Russia and Ukraine. There are also some trees in France, Spain, Portugal and in the Balkans. It is the type species of the subgenus *Padus*, which have flowers in racemes.

A Bird Cherry tree in full bloom

A blooming hackberry tree in Donetsk, Ukraine

17.1 Characteristics

The English name "hackberry"[*][3] refers to the fruit, which is astringent due to their tannin content.[*][4]

There are two varieties:

- **European Bird Cherry** *Prunus padus* var. *padus*, Europe and western Asia.
- **Asian Bird Cherry** *Prunus padus* var. *commutata*, eastern Asia.

17.2 Ecology

The flowers are hermaphroditic and pollinated by bees and flies. The fruit is readily eaten by birds, which do not taste astringency as unpleasant.

Bird-cherry Ermine moth (*Yponomeuta evonymella*) uses bird-cherry as its host plant, and the larvae can eat single trees leafless.

17.3 Poison

The glycosides prulaurasin and amygdalin, which can be poisonous to some mammals, are present in some parts of *P. padus*, including the leaves, stems and fruits.[*][5]

17.4 Uses

The fruit of this tree is seldom used in western Europe, but is commonly eaten farther east.

It was used medicinally during the Middle Ages.

The bark of the tree, placed at the door, was supposed to ward off plague.

It is also sold as an ornamental in North America as a **May Day** tree.

A taboo on the use of the wood was reported by natives of Advie, in northeast Scotland, being regarded as a "witches tree".[*][3]

17.5 See also

- *Taphrina padi* - A Pocket Plum gall that occurs on Bird Cherry

17.6 References

[1] Rehder, A. 1940, reprinted 1977. *Manual of cultivated trees and shrubs hardy in North America exclusive of the subtropical and warmer temperate regions*. Macmillan publishing Co., Inc, New York.

[2] "The Plant List: A Working List of All Plant Species". Retrieved January 27, 2014.

[3] Walter Gregor, "Some Folklore of Trees, Animals, and River-fishing from the N.E. of Scotland" *The Folk-Lore Journal*. Volume 7, 1889. p. 41.

[4] "Bird cherry (*Prunus padus*)". Science & Plants for Schools (U.K.).

[5] N.D.Sargison; D.S.Williamson; J.R.Duncan; R.W.McCance (1996). "*Prunus Padus* (bird cherry) poisoning in cattle". *Veterinary Record* **138**: 188. doi:10.1136/vr.138.8.188. ⋯stems, leaves and fruits of *P. padus* contain the glycosides prulaurasin and amygdalin⋯

17.7 External links

- Tips to identify bird cherry from btcv

Chapter 18

Prunus spinosa

"Blackthorn" redirects here. For other uses, see Blackthorn (disambiguation).

Prunus spinosa (**blackthorn**, or **sloe**) is a species of *Prunus* native to Europe, western Asia, and locally in northwest Africa.[*][2][*][3] It is also locally naturalised in New Zealand and eastern North America.[*][3]

18.1 Names

The specific name *spinosa* is a Latin term indicating the pointed and thornlike spur shoots characteristic of this species.

The common name "blackthorn" is due to the thorny nature of the shrub, and its very dark bark.

The word commonly used for the fruit, "sloe" comes from Old English *slāh*. The same word is noted in Middle Low German, historically spoken in Lower Saxony, Middle Dutch *sleuuwe* or, contracted form, *slē*, from which come Modern Low German words: *slē*, *slī*, and Modern Dutch *slee*, Old High German *slēha*", "*slēwa*, from which come Modern German *Schlehe* and Danish *slåen*.

The names related to 'sloe' come from the Common Germanic root **slaiχwōn*. Cf. West Slavic / Polish *śliwa*; plum of any species, including sloe *śliwa tarnina*—root present in other Slavic languages, e.g. Croatian/Serbian *šljiva* / шљива.

The expression "sloe-eyed" for a person with dark eyes comes from the fruit, and is first attested in A. J. Wilson's 1867 novel *Vashti*.[*][4]

18.2 Description

Prunus spinosa is a large deciduous shrub or small tree growing to 5 metres (16 ft) tall, with blackish bark and dense, stiff, spiny branches. The leaves are oval, 2–4.5 centimetres (0.79–1.77 in) long and 1.2–2 centimetres (0.47–0.79 in) broad, with a serrated margin. The flowers are 1.5 centimetres (0.59 in) diameter, with five creamy-white petals; they are produced shortly before the leaves in early spring, and are hermaphroditic and insect-pollinated. The fruit, called a "sloe", is a drupe 10–12 millimetres (0.39–0.47 in) in diameter, black with a purple-blue waxy bloom, ripening in autumn, and harvested—traditionally, at least in the UK, in October or November after the first frosts. Sloes are thin-fleshed, with a very strongly astringent flavour when fresh.[*][2]

Prunus spinosa is frequently confused with the related *P. cerasifera* (cherry plum), particularly in early spring when the latter starts flowering somewhat earlier than *P. spinosa*. They can be distinguished by flower colour, creamy white in *P. spinosa*, pure white in *P. cerasifera*. They can also be distinguished in winter by the more shrubby habit with stiffer, wider-angled branches of *P. spinosa*; in summer by the relatively narrower leaves of *P. spinosa*, more than twice as long as broad;[*][2][*][5] and in autumn by the colour of the fruit skin—purplish-black in *P. spinosa* and yellow or red in *P. cerasifera*.

Prunus spinosa has a tetraploid ($2n=4x=32$) set of chromosomes.[*][6]

18.3 Ecology

See also List of Lepidoptera that feed on Prunus

The foliage is sometimes eaten by the larvae of Lepidoptera, including emperor moth, willow beauty, white-pinion spotted, common emerald, November moth, pale November moth, mottled pug, green pug, brimstone moth, feathered thorn, brown-tail, yellow-tail, short-cloaked moth, lesser yellow underwing, lesser broad-bordered yellow underwing, double square-spot, black and brown hairstreaks, hawthorn moth (*Scythropia crataegella*) and the case-bearer moth *Coleophora anatipennella*. Dead blackthorn wood provides food for the caterpillars of the concealer moth *Esperia oliviella*.

The pocket plum gall is found on the fruit, where it results in an elongated and flattened gall, devoid of a stone.

18.4 Uses

The shrub, with its savage thorns, is traditionally used in Northern Europe and Britain in making a hedge against cattle or a "cattle-proof" hedge.*[7]

The fruit is similar to a small damson or plum, suitable for preserves, but rather tart and astringent for eating, unless it is picked after the first few days of autumn frost. This effect can be reproduced by freezing harvested sloes.

The juice is used in the manufacture of spurious port wine, and used as an adulterant to impart roughness to genuine port.*[8]*[9] In rural Britain, so-called sloe gin is made from the fruit, though this is not a true gin, but an infusion of gin with the fruit and sugar to produce a liqueur. In Navarre, Spain, a popular liqueur called *pacharan* is made with sloes. In France a similar liqueur called *épine* or *épinette* or *troussepinette* is made from the young shoots in spring. In Italy, the infusion of spirit with the fruits and sugar produces a liqueur called *bargnolino* (or sometimes *prunella*) - as well as in France where it is called "prunelle". Wine made from fermented sloes is made in Britain, and in Germany and other central European countries. Sloes can also be made into jam and, used in fruit pies, and if preserved in vinegar are similar in taste to Japanese *umeboshi*. The juice of the berries dyes linen a reddish color that washes out to a durable pale blue.*[10]

Blackthorn makes an excellent fire wood that burns slowly with a good heat and little smoke.*[11] The wood takes a fine polish and is used for tool handles and canes.*[12] Straight blackthorn stems have traditionally been made into walking sticks or clubs (known in Ireland as a shillelagh).*[13] In the British Army, blackthorn sticks are carried by commissioned officers of the Royal Irish Regiment; the tradition also occurs in Irish regiments in some Commonwealth countries.

The leaves resemble tea leaves, and were used as an adulterant of tea.*[9]*[12] Shlomo Yitzhaki, a Talmudist and Tanakh commentator of the High Middle Ages, writes that the sap (or gum) of *P. spinosa* (or what he refers to as the *prunellier*) was used as an ingredient in the making of some inks used for manuscripts.*[14]

The fruit stones have been found in Swiss lake dwellings.*[9]

Evidence of the early use of sloes by man is found in the famous case of a 5,300-year-old human mummy discovered in 1991 in the Ötztal Alps along the Austrian-Italian border (nick-named Ötzi): among the stomach contents were sloes.*[15]

A "sloe-thorn worm" used as fishing bait is mentioned in the 15th-century work, *The Treatyse of Fishing with an Angle*, by Juliana Berners.*[16]

18.5 See also

- Sloe gin
- Damson

18.6 References

[1] "The Plant List: A Working List of All Plant Species". Retrieved January 27, 2014.

[2] Rushforth, K. (1999). *Trees of Britain and Europe*. Collins ISBN 0-00-220013-9.

[3] Den Virtuella Floran: *Prunus spinosa* map

[4] *Oxford English Dictionary*

[5] Vedel, H., & Lange, J. (1960). *Trees and Bushes in Wood and Hedgerow*. Metheun & Co. Ltd., London.

[6] Weinberger, J. H. 1975. Plums. Pp. 336–347 in *Advances in fruit breeding*, eds. J. Janick and J. N. Moore. West Lafayette: Purdue University Press.

[7] Alice M. Coats, *Garden Shrubs and Their Histories* (1964) 1992, *s.v.* "Prunus".

[8] "Sloe". *New International Encyclopedia*. 1905.

[9] One or more of the preceding sentences incorporates text from a publication now in the public domain: Rines, George Edwin, ed. (1920). "Sloe". *Encyclopedia Americana*.

[10] Coats (1964) 1992.

[11] The Scout Association 1999. *The Burning Properties of Wood*, London, U.K.

[12] One or more of the preceding sentences incorporates text from a publication now in the public domain: Beach, Chandler B., ed. (1914). "Sloe". *The New Student's Reference Work*. Chicago: F. E. Compton and Co.

[13] Chouinard B.A., Maxime. "The stick is king: The Shillelagh Bata or the rediscovery of a living Irish martial tradition" (PDF). Retrieved 5 July 2011.

[14] *Talmud Bavli, Tractate Shabbat 23a*

[15] Tia Ghose (November 8, 2012). "Mummy Melodrama: Top 9 Secrets About Otzi the Iceman". LiveScience. Retrieved November 10, 2012. (to locate, click ahead to part 4)

[16] *The Treatyse of Fishing with an Angle* (attributed to Dame Juliana Berners in the 15th century)

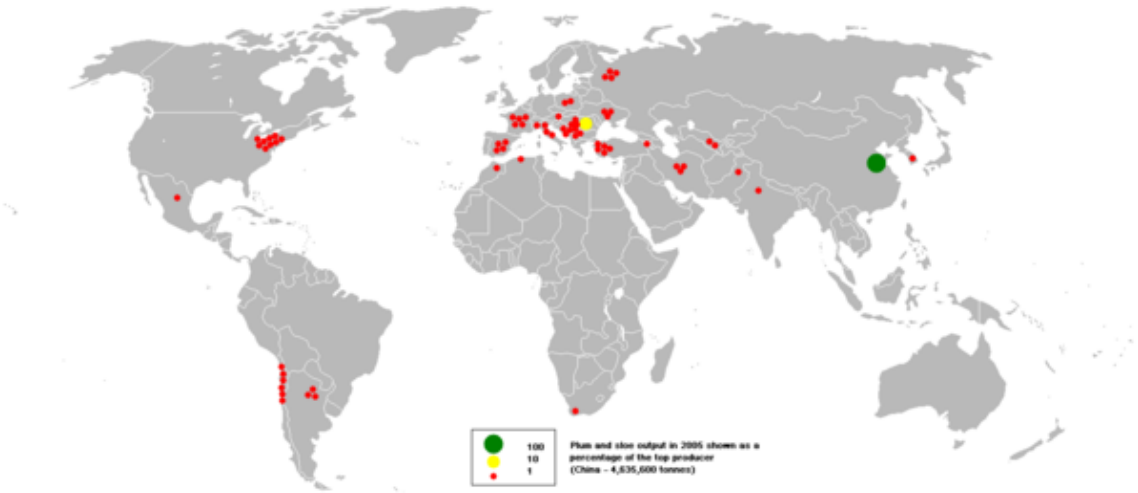
18.7 External links

- Cookipedia entry for Sloe Recipes

Sloe (Prunus spinosa) flower, fruit, seed and leaves as illustrated by Otto Wilhelm Thomé (1885).

Plant in flower in early spring

Pocket Plum gall on Blackthorn, caused by the fungus Taphrina pruni



Plum and sloe output in 2005

Grafted blackthorn tree; called a Husband and Wife tree

Chapter 19

Elm

"Elms" redirects here. For the racing series, see European Le Mans Series.
For other uses, see Elm (disambiguation).

Elms are deciduous and semi-deciduous trees comprising the genus *Ulmus* in the plant family Ulmaceae. The genus first appeared in the Miocene geological period about 20 million years ago, originating in what is now central Asia.*[1] These trees flourished and spread over most of the Northern Hemisphere, inhabiting the temperate and tropical-montane regions of North America and Eurasia, ranging southward across the Equator into Indonesia.

Elms are components of many kinds of natural forests. Moreover, during the 19th and early 20th centuries many species and cultivars were also planted as ornamental street, garden, and park trees in Europe, North America, and parts of the Southern Hemisphere, notably Australasia. Some individual elms reached great size and age. However, in recent decades, most mature elms of European or North American origin have died from Dutch elm disease, caused by a microfungus dispersed by bark beetles. In response, disease-resistant cultivars have been developed, capable of restoring the elm to forestry and landscaping.

19.1 Taxonomy

Main articles: List of Elm species and varieties by common name, Alphabetical list of extant Elm species by scientific name, List of Elm species and varieties by scientific name, List of Elm cultivars, hybrids and hybrid cultivars and List of Elm synonyms and accepted names

There are about 30 to 40 species of *Ulmus* (elm); the ambiguity in number results from difficulty in delineating species, owing to the ease of hybridization between them and the development of local seed-sterile vegetatively propagated microspecies in some areas, mainly in the field elm (*Ulmus minor*) group. Rackham*[2] describes *Ulmus* as the most difficult critical genus in the entire British flora, adding that 'species and varieties are a distinction in the human mind rather than a measured degree of genetic variation'. Eight species are endemic to North America, and a smaller number to Europe;*[3] the greatest diversity is found in Asia.*[4]

The classification adopted in the List of elm species, varieties, cultivars and hybrids is largely based on that established by Brummitt.*[5] A large number of synonyms have accumulated over the last three centuries; their currently accepted names can be found in the list List of elm Synonyms and Accepted Names.

Botanists who study elms and argue over elm identification and classification are called *pteleologists*, from the Greek πτελέα (:elm).*[6]

As part of the sub-order urticalean rosids they are distant cousins of cannabis, hops, and nettles.

19.1.1 Etymology

The name *Ulmus* is the classical name for these trees, with the English name "elm" and many other European names derived from it.*[7]

19.2 Description

The genus is hermaphroditic, having apetalous perfect flowers which are wind-pollinated. Elm leaves are alternate, with simple, single- or, most commonly, doubly serrate margins, usually asymmetric at the base and acuminate at the apex. The fruit is a round wind-dispersed samara flushed with chlorophyll, facilitating photosynthesis before the leaves emerge.*[8] All species are tolerant of a wide range of soils and pH levels but, with few exceptions, demand good drainage.

- 'Sapporo Autumn Gold', Antella, Florence
- Wych elm (*Ulmus glabra*) leaves and seeds
- Asymmetry of leaf, Slippery Elm *U. rubra*
- Mature bark, Slippery Elm *U. rubra*
- Flowers of the hybrid elm cultivar 'Columella'
- Corky wings, Winged Elm *U. alata*
- *U. laciniata* samara
- *U. americana*, Dufferin St., Toronto, c. 1914

19.3 Pests and diseases

Main article: List of elm diseases

19.3.1 Dutch elm disease

Main article: Dutch elm disease

Dutch elm disease (DED) devastated elms throughout Europe and much of North America in the second half of the 20th century. It derives its name 'Dutch' from the first description of the disease and its cause in the 1920s by the Dutch botanists Bea Schwarz and Christina Johanna Buisman. Owing to its geographical isolation and effective quarantine enforcement, Australia has so far remained unaffected by Dutch Elm Disease, as have the provinces of Alberta and British Columbia in western Canada.

DED is caused by a micro-fungus transmitted by two species of *Scolytus* elm-bark beetle which act as vectors. The disease affects all species of elm native to North America and Europe, but many Asiatic species have evolved anti-fungal genes and are resistant. Fungal spores, introduced into wounds in the tree caused by the beetles, invade the xylem or vascular system. The tree responds by producing tyloses, effectively blocking the flow from roots to leaves. Woodland trees in North America are not quite as susceptible to the disease because they usually lack the root-grafting of the urban elms and are somewhat more isolated from each other. In France, inoculation with the fungus of over three hundred clones of the European species failed to find a single variety possessed of any significant resistance.

The first, less aggressive strain of the disease fungus, *Ophiostoma ulmi*, arrived in Europe from the Far East in 1910, and was accidentally introduced to North America in 1928, but was steadily weakened by viruses and had all but disappeared in Europe by the 1940s. The second, far more virulent strain of the disease *Ophiostoma novo-ulmi* was identified in Europe in the late 1960s, and within a decade had killed over 20 million trees (approximately 75%) in the UK alone. Approximately three times more deadly, the new strain arrived in Europe from the USA; the hypothesis that it arose from a hybrid between the original *O. ulmi* and another strain endemic to the Himalaya, *Ophiostoma himal-ulmi* is now discredited.*[9]

There is no sign of the current pandemic waning, and no evidence of a susceptibility of the fungus to a disease of its own caused by d-factors: naturally occurring virus-like agents that severely debilitated the original *O. ulmi* and reduced its sporulation.*[10]

19.3.2 Elm phloem necrosis

Elm phloem necrosis (elm yellows) is a disease of elm trees that is spread by leafhoppers or by root grafts.*[11] This very aggressive disease, with no known cure, occurs in the Eastern United States, southern Ontario in Canada, and Europe. It is caused by phytoplasmas which infect the phloem (inner bark) of the tree.*[12] Infection and death of the phloem effectively girdles the tree and stops the flow of water and nutrients. The disease affects both wild-growing and cultivated trees. Occasionally, cutting the infected tree before the disease completely establishes itself and cleanup and prompt disposal of infected matter has resulted in the plant's survival via stump-sprouts.

19.3.3 Insects

Most serious of the elm pests is the elm leaf beetle *Xanthogaleruca luteola*, which can decimate foliage, although rarely with fatal results. The beetle was accidentally introduced to North America from Europe. Another unwelcome immigrant to North America is the Japanese beetle *Popillia japonica*. In both instances the beetles cause far more damage in North America owing to the absence of the predators present in their native lands. In Australia, introduced elm trees are sometimes used as foodplants by the larvae of hepialid moths of the genus *Aenetus*. These burrow horizontally into the trunk then vertically down.*[13]*[14]

19.3.4 Birds

Sapsucker woodpeckers have a great love of young elm trees.

19.3.5 Development of trees resistant to Dutch elm disease

See also: List of Elm cultivars, hybrids and hybrid cultivars

Efforts to develop resistant cultivars began in the Netherlands in 1928 and continued, uninterrupted by World War II, until 1992.*[15] Similar programmes were initiated in North America (1937), Italy (1978), and Spain (1990s). Research has followed two paths:

Species and species cultivars

In North America, careful selection has produced a number of trees resistant not only to disease, but also to the droughts and extremely cold winters afflicting the continent. Research in the USA has concentrated on the American Elm *U. americana*, resulting in the release of highly resistant clones, notably the cultivars 'Valley Forge' and 'Jefferson'. Much work has also been done into the selection of disease-resistant Asiatic species and cultivars.*[16]*[17]

In Europe, the European White Elm *Ulmus laevis* has received much attention. Whilst this elm has little innate resistance to Dutch elm disease, it is not favoured by the vector bark beetles and thus only becomes colonized and infected when there are no other choices, a rare situation in western Europe. Research in Spain has suggested that it may be the presence of a triterpene, alnulin, which makes the tree bark unattractive to the beetle species that spread the disease.*[18] However this possibility has not been conclusively proven.*[19] More recently, Field Elms *Ulmus minor* highly resistant to DED have been discovered in Spain, and form the basis of a major breeding programme.*[20]

Hybrid cultivars

Owing to their innate resistance to Dutch elm disease, Asiatic species have been crossed with European species, or with other Asiatic elms, to produce trees which are both highly resistant to disease and tolerant of native climates. After a number of false dawns in the 1970s, this approach has produced a range of reliable hybrid cultivars now commercially available in North America and Europe.*[21]*[22]*[23]*[24]*[25]*[26]*[27]

However, some of these cultivars, notably those with the Siberian Elm *U. pumila* in their ancestry, lack the forms for which the iconic American Elm and English Elm were prized. Moreover, several exported to northwestern Europe have proven unsuited to the maritime climate conditions there, notably because of their intolerance of anoxic conditions resulting from ponding on poorly drained soils in winter. Dutch hybridizations invariably included the

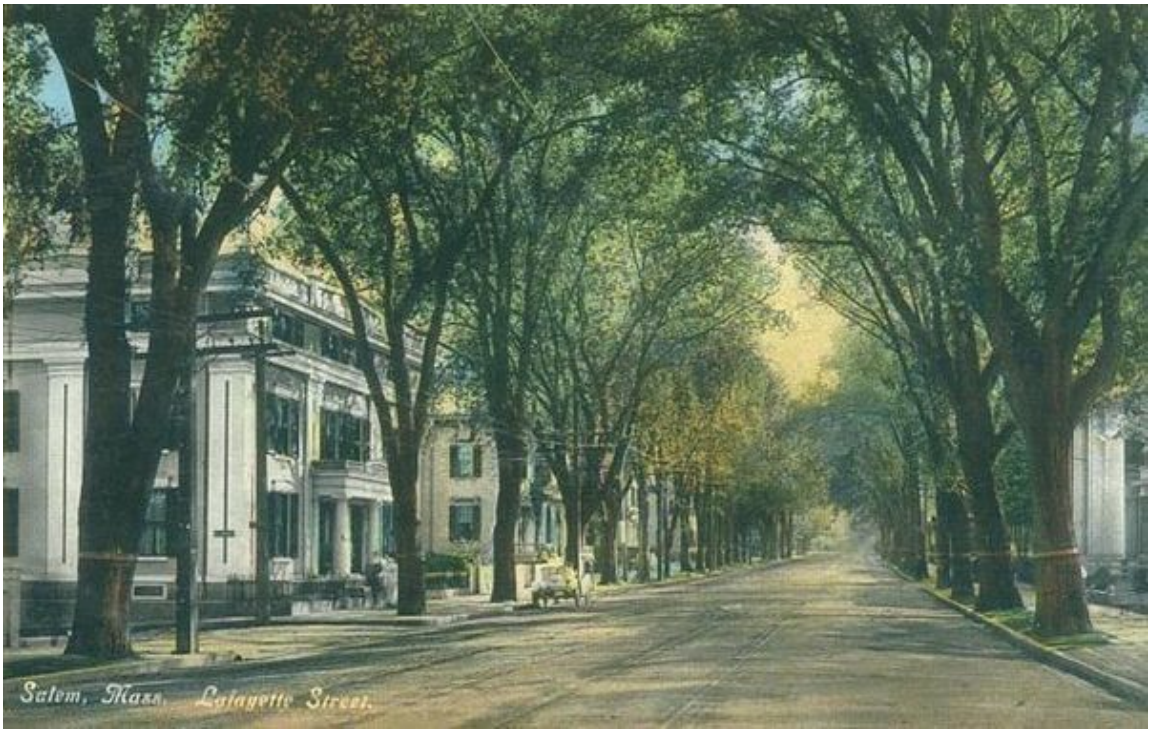
Himalayan Elm *U. wallichiana* as a source of anti-fungal genes and have proven more tolerant of wet ground; they should also ultimately reach a greater size. However, the susceptibility of the cultivar 'Lobel', used as a control in Italian trials, to elm yellows has now (2014) raised a question mark over all the Dutch clones.*[27]

A number of highly resistant *Ulmus* cultivars has been released since 2000 by the Institute of Plant Protection in Florence, most commonly featuring crosses of the Dutch cultivar 'Plantijn' with the Siberian Elm to produce resistant trees better adapted to the Mediterranean climate.*[22]

Cautions regarding novel cultivars

Elms take many decades to grow to maturity, and as the introduction of these disease-resistant cultivars is relatively recent, their long-term performance and ultimate size and form cannot be predicted with certainty. The National Elm Trial in North America, begun in 2005, is a nationwide trial to assess strengths and weaknesses of the 19 leading cultivars raised in the USA over a ten-year period; European cultivars have been excluded. Meanwhile, in Europe, American and European cultivars are being assessed in field trials started in 2000 by the UK charity Butterfly Conservation.*[28]

The ball-headed graft narvan elm, Ulmus minor *'Umbraculifera', cultivated in Persia and widely planted in central Asia (Photo: Ronnie Nijboer)*



Lafayette Street, Salem, Massachusetts: an example of the 'high-tunnelled effects' of Ulmus americana *avenues once common in New England*

19.4 Uses of elms in landscaping

*Camperdown elm (*Ulmus glabra *'Camperdown'), cultivated in Prospect Park, Brooklyn, New York*

One of the earliest of ornamental elms was the ball-headed graft *narvan elm*, *Ulmus minor* 'Umbraculifera', cultivated from time immemorial in Persia as a shade tree and widely planted in cities through much of south-west and central Asia. From the 18th century to the early 20th century, elms, whether species, hybrids or cultivars, were among

An avenue of elm trees in Fitzroy Gardens, Melbourne

the most widely planted ornamental trees in both Europe and North America. They were particularly popular as a street tree in avenue plantings in towns and cities, creating high-tunnelled effects. Their quick growth and variety of foliage and forms,* [29] their tolerance of air-pollution and the comparatively rapid decomposition of their leaf-litter

in the fall were further advantages. In North America, the species most commonly planted was the American elm (*Ulmus americana*), which had unique properties that made it ideal for such use: rapid growth, adaptation to a broad range of climates and soils, strong wood, resistance to wind damage, and vase-like growth habit requiring minimal pruning. In Europe, the wych elm (*Ulmus glabra*) and the Field Elm (*Ulmus minor*) were the most widely planted in the countryside, the former in northern areas including Scandinavia and northern Britain, the latter further south. The hybrid between these two, Dutch elm (*U.* × *hollandica*), occurs naturally and was also commonly planted. In much of England, it was the English Elm which later came to dominate the horticultural landscape. Most commonly planted in hedgerows, it sometimes occurred in densities of over 1000 per square kilometre. In south-eastern Australia and New Zealand, large numbers of English and Dutch elms, as well as other species and cultivars, were planted as ornamentals following their introduction in the 19th century, while in northern Japan Japanese Elm (*Ulmus davidiana* var. *japonica*) was widely planted as a street tree. From about 1850 to 1920, the most prized small ornamental elm in parks and gardens was the Camperdown elm (*Ulmus glabra* 'Camperdownii'), a contorted weeping cultivar of the Wych Elm grafted on to a non-weeping elm trunk to give a wide, spreading and weeping fountain shape in large garden spaces.

In northern Europe elms were, moreover, among the few trees tolerant of saline deposits from sea spray, which can cause "salt-burning" and die-back. This tolerance made elms reliable both as shelterbelt trees exposed to sea wind, in particular along the coastlines of southern and western Britain*[30]*[31] and in the Low Countries, and as trees for coastal towns and cities.*[32]

This *belle époque* lasted until the First World War, when as a consequence of hostilities, notably in Germany whence at least 40 cultivars originated, and of the outbreak at about the same time of the early strain of Dutch elm disease, *Ophiostoma ulmi*, the elm began its slide into horticultural decline. The devastation caused by the Second World War, and the demise in 1944 of the huge Späth nursery in Berlin, only accelerated the process. The outbreak of the new, three times more virulent, strain of Dutch elm disease *Ophiostoma novo-ulmi* in the late 1960s brought the tree to its nadir.

Since circa 1990 the elm has enjoyed a renaissance through the successful development in North America and Europe of cultivars highly resistant to the new disease.*[8] Consequently, the total number of named cultivars, ancient and modern, now exceeds 300, although many of the older clones, possibly over 120, have been lost to cultivation. Some of the latter, however, were by today's standards inadequately described or illustrated before the pandemic, and it is possible that a number survive, or have regenerated, unrecognised. Enthusiasm for the newer clones often remains low owing to the poor performance of earlier, supposedly disease-resistant Dutch trees released in the 1960s and 1970s. In the Netherlands, sales of elm cultivars slumped from over 56,000 in 1989 to just 6,800 in 2004,*[33] whilst in the UK, only four of the new American and European releases were commercially available in 2008.

19.5 Other uses of elms

19.5.1 Wood

Elm wood was valued for its interlocking grain, and consequent resistance to splitting, with significant uses in wagon wheel hubs, chair seats and coffins. The bodies of Japanese Taiko drums are often cut from the wood of old elm trees, as the wood's resistance to splitting is highly desired for nailing the skins to them, and a set of three or more is often cut from the same tree. The elm's wood bends well and distorts easily making it quite pliant. The often long, straight, trunks were favoured as a source of timber for keels in ship construction. Elm is also prized by bowyers; of the ancient bows found in Europe, a large portion of them are elm. During the Middle Ages elm was also used to make longbows if yew was unavailable.

The first written references to elm occur in the Linear B lists of military equipment at Knossos in the Mycenaean Period. Several of the chariots are of elm (« πτε-ρε-ϝα », *pte-re-wa*), and the lists twice mention wheels of elm-wood.*[34] Hesiod says that ploughs in Ancient Greece were also made partly of elm.*[35]

The density of elm wood varies between species, but averages around 560 kg per cubic metre.*[36]

Elm wood is also resistant to decay when permanently wet, and hollowed trunks were widely used as water pipes during the medieval period in Europe. Elm was also used as piers in the construction of the original London Bridge. However this resistance to decay in water does not extend to ground contact.*[36]

Elm wood

19.5.2 Viticulture

The Romans, and more recently the Italians, used to plant elms in vineyards as supports for vines. Lopped at three metres, the elms' quick growth, twiggy lateral branches, light shade and root-suckering made them ideal trees for this purpose. The lopped branches were used for fodder and firewood.*[37] Ovid in his *Amores* characterizes the elm as "loving the vine": *ulmus amat vitem, vitis non deserit ulmum* (:*the elm loves the vine, the vine does not desert the elm*),*[38] and the ancients spoke of the "marriage" between elm and vine.*[39]

19.5.3 Medicinal products

The mucilaginous inner bark of the Slippery Elm *Ulmus rubra* has long been used as a demulcent, and is still produced commercially for this purpose in the United States with approval for sale as a nutritional supplement by the U.S. Food and Drug Administration.*[40]

19.5.4 Fodder

Elms also have a long history of cultivation for fodder, with the leafy branches cut to feed livestock. The practice continues today in the Himalaya, where it contributes to serious deforestation.*[41]

19.5.5 Biomass

As fossil fuel resources diminish, increasing attention is being paid to trees as sources of energy. In Italy, the Istituto per la Protezione delle Piante is (2012) in the process of releasing to commerce very fast-growing elm cultivars, able to increase in height by more than 2 m (6 ft) per annum.*[22]

Elm in boat-building: John Constable, Boat-building near Flatford Mill*, 1815 (landscape with hybrid elms* Ulmus × hollandica*[1])*

English longbow of elm

19.5.6 Food

Elm bark, cut into strips and boiled, sustained much of the rural population of Norway during the great famine of 1812. The seeds are particularly nutritious, comprising 45% crude protein, and less than 7% fibre by dry mass.*[42]

Internal mill-wheel of elm, De Hoop mill, Oldebroek, Netherlands

19.5.7 Alternative medicine

Elm has been listed as one of the 38 substances that are used to prepare Bach flower remedies,[*][43] a kind of alternative medicine promoted for its effect on health. However according to Cancer Research UK, "there is no scientific evidence to prove that flower remedies can control, cure or prevent any type of disease, including cancer".[*][44]

19.5.8 Bonsai

Chinese elm *Ulmus parvifolia* is a popular choice for bonsai owing to its tolerance of severe pruning.

19.6 Genetic resource conservation

In 1997, a European Union elm project was initiated, its aim to coordinate the conservation of all the elm genetic resources of the member states and, among other things, to assess their resistance to Dutch elm disease. Accordingly, over 300 clones were selected and propagated for testing.[*][45][*][46][*][47]

19.7 Notable elm trees

Main article: List of notable elm trees

Many elm (*Ulmus*) trees of various kinds have attained great size or otherwise become particularly noteworthy.

Chinese Elm Ulmus parvifolia *bonsai*

19.8 The elm in art

Many artists have admired elms for the ease and grace of their branching and foliage, and have painted them with sensitivity. Elms are a recurring element in the landscapes and studies of, for example, John Constable, Ferdinand Georg Waldmüller, Frederick Childe Hassam, Karel Klinkenberg,*[48] and George Inness.

- John Constable, 'Study of an Elm Tree' [1821]
- John Constable, 'The Cornfield' [1826] (*Ulmus* × *hollandica**[1])
- Constable, 'Salisbury Cathedral from the Bishop's Garden' [1823 version] (*Ulmus* × *hollandica**[1])
- Jacob George Strutt, *Elms at Mongewell, Oxfordshire* [1830] (*Ulmus procera*)
- Ferdinand Georg Waldmüller, 'Alte Ulmen im Prater' (:Old Elms in Prater) [1831]
- James Duffield Harding, 'The Great Exhibition of 1851' (*Ulmus procera*, centre)
- Arthur Hughes, 'Home from Sea' [1862] (*Ulmus procera**[1])
- Ford Madox Brown, 'Work' [1863] (*Ulmus procera**[1])
- [unknown artist] *The American Elm* [1879] (*Ulmus americana*)
- Johannes Karel Christiaan Klinkenberg, 'Amsterdam' [1890] (*Ulmus x hollandica* 'Belgica')
- Frederick Childe Hassam, 'Champs Elysées, Paris' [1889] (*Ulmus* × *hollandica*, 'orme femelle'*[1])
- Frederick Childe Hassam, 'Washington Arch, Spring' [1893] (*Ulmus americana*)
- Frederick Childe Hassam, 'Church at Old Lyme' [1905] (*Ulmus americana*)

- Frederick Childe Hassam, 'The East Hampton Elms in May' [1920] (*Ulmus americana*)
- George Inness, 'Old Elm at Medfield' (*Ulmus americana*)
- Unknown artist, 'The Cam near Trinity College, Cambridge', England (*Ulmus procera*)

1. ^ Cite error: The named reference Richens was invoked but never defined (see the help page).

19.9 The elm in mythology and literature

Achilles and Scamander

In Greek mythology the nymph Ptelea (Πτελέα, Elm) was one of the eight Hamadryads, nymphs of the forest and daughters of Oxylos and Hamadryas.*[49]

The first reference in literature to elms occurs in the Iliad. When Eetion, father of Andromache, is killed by Achilles during the Trojan War, the Mountain Nymphs plant elms on his tomb («περὶ δὲ πτελέοι εφύτεψαν νύμφαι ὀρεστιάδες, κοῦραι Διὸς αἰγιόχοιο»).*[50] Also in the Iliad, when the River Scamander, indignant at the sight of so many corpses in his water, overflows and threatens to drown Achilles, the latter grasps a branch of a great elm in an attempt to save himself («ὁ δὲ πτελέην ἕλε χερσὶν εὐφυέα μεγάλην».*[51]

The Nymphs also planted elms on the tomb in the Thracian Chersonese of "great-hearted Protesilaus'' («μεγάθυμου Πρωτεσιλάου»), the first Greek to fall in the Trojan War. These elms grew to be the tallest in the known world; but when their topmost branches saw far off the ruins of Troy, they immediately withered, so great still was the bitterness of the hero buried below, who had been loved by Laodamia and slain by Hector.*[52]*[53]*[54] The story is the subject of a poem by Antiphilus of Byzantium (1st century A.D.) in the Palatine Anthology:

> Θεσσαλὲ Πρωτεσίλαε, σὲ μὲν πολὺς ἄσεται αἰών,
> Τροίᾳ ὀφειλομένου πτώματος ἀρξάμενον•

Dryad

σᾶμα δὲ τοι πτελέῃσι συνηρεφὲς ἀμφικομεῦση
Νύμφαι, ἀπεχθομένης Ἰλίου ἀντιπέρας.
Δένδρα δὲ δυσμήνιτα, καὶ ἢν ποτε τεῖχος ἴδωσι
Τρώϊον, αὐαλέην φυλλοχοεῦντι κόμην.
ὅσσος ἐν ἡρώεσσι τότ᾽ ἦν χόλος, οὗ μέρος ἀκμὴν
ἐχθρὸν ἐν ἀψύχοις σώζεται ἀκρέμοσιν.*[55]

[:Thessalian Protesilaos, a long age shall sing your praises,
Of the destined dead at Troy the first;
Your tomb with thick-foliaged elms they covered,
The nymphs, across the water from hated Ilion.
Trees full of anger; and whenever that wall they see,
Of Troy, the leaves in their upper crown wither and fall.
So great in the heroes was the bitterness then, some of which still
Remembers, hostile, in the soulless upper branches.]

Protesilaus had been king of Pteleos (*Πτελεός*) in Thessaly, which took its name from the abundant elms (*πτελέοι*) in the region.*[56]

Elms occur often in Pastoral Poetry, where they symbolise the idyllic life, their shade being mentioned as a place of special coolness and peace. In the first Idyll of Theocritus, for example, the goat-herd invites the shepherd to sit "here beneath the elm" («δεῦρ᾽ ὑπὸ τὰν πτελέαν») and sing. Beside elms Theocritus places "the sacred water" («το ἱερὸν ὕδωρ») of the Springs of the Nymphs and the shrines to the nymphs.*[57]

Aside from references literal and metaphorical to the elm and vine theme, the tree occurs in Latin literature in the Elm of Dreams in the Aeneid.*[58] When the Sibyl of Cumae leads Aeneas down to the Underworld, one of the sights is the Stygian Elm:

> In medio ramos annosaque bracchia pandit
> ulmus opaca, ingens, quam sedem somnia vulgo
> uana tenere ferunt, foliisque sub omnibus haerent.
>
> [:Spreads in the midst her boughs and agéd arms
> an elm, huge, shadowy, where vain dreams, 'tis said,
> are wont to roost them, under every leaf close-clinging.]

Virgil refers to a Roman superstition (*vulgo*) that elms were trees of ill-omen because their fruit seemed to be of no value.*[59] It has been noted*[60] that two elm-motifs have arisen from classical literature: (1) the 'Paradisal Elm' motif, arising from pastoral idylls and the elm-and-vine theme, and (2) the 'Elm and Death' motif, perhaps arising from Homer's commemorative elms and Virgil's Stygian Elm. Many references to elm in European literature from the Renaissance onwards fit into one or other of these categories.

There are two examples of *pteleogenesis* (:birth from elms) in world myths. In Germanic and Scandinavian mythology the first woman, Embla, was fashioned from an elm,*[61] while in Japanese mythology Kamuy Fuchi, the chief goddess of the Ainu people, "was born from an elm impregnated by the Possessor of the Heavens" .*[62]

The elm occurs frequently in English literature, one of the best known instances being in Shakespeare's *A Midsummer Night's Dream*, where Titania, Queen of the Fairies, addresses her beloved Nick Bottom using an elm-simile. Here, as often in the elm-and-vine motif, the elm is a masculine symbol:

> Sleep thou, and I will wind thee in my arms.
> ... the female Ivy so
> Enrings the barky fingers of the Elm.
> O, how I love thee! how I dote on thee!*[63]

Another of the most famous kisses in English literature, that of Paul and Helen at the start of Forster's Howards End, is stolen beneath a great wych elm.

The Elm Tree is also referenced in children's literature. *An Elm Tree and Three Sisters* is a children's book about three young sisters that plant a small elm tree in their backyard. Throughout the years, the sisters begin to realize that the elm tree becomes an integral part of their lives. The sisters see that the elm tree has been with them through many important milestones through life and they grow old with the tree.

*[64]

19.10 The elm in politics

The Cutting of the elm was a diplomatic altercation between the Kings of France and England in 1188, during which an elm tree near Gisors in Normandy was felled.

In politics the elm is associated with revolutions. In England after the Glorious Revolution of 1688, the final victory of parliamentarians over monarchists, and the arrival from Holland, with William & Mary, of the 'Dutch Elm' hybrid, planting of this cultivar became a fashion among enthusiasts of the new political order.*[2]*[65]

In the American Revolution 'The Liberty Tree' was an American white elm in Boston, Massachusetts, in front of which, from 1765, the first resistance meetings were held against British attempts to tax the American colonists without democratic representation. When the British, knowing that the tree was a symbol of rebellion, felled it in

1775, the Americans took to widespread 'Liberty Elm' planting, and sewed elm symbols on to their revolutionary flags.*[66]*[67] Elm-planting by American Presidents later became something of a tradition.

In the French Revolution, too, *Les arbres de la liberté* (:Liberty Trees), often elms, were planted as symbols of revolutionary hopes - the first in Vienne, Isère, in 1790, by a priest inspired by the Boston elm.*[66] *L'Orme de La Madeleine* (:the Elm of La Madeleine), Faycelles, Département de Lot, planted around 1790 and surviving to this day, was a case in point.*[68] By contrast, a famous Parisian elm associated with the *Ancien Régime*, *L'Orme de Saint-Gervais* in the Place St-Gervais, was *felled* by the revolutionaries; church authorities planted a new elm in its place in 1846, and an early 20th-century elm stands on the site today.*[69] Premier Lionel Jospin, obliged by tradition to plant a tree in the garden of the Hôtel Matignon, the official residence and workplace of Prime Ministers of France, insisted on planting an elm, so-called 'tree of the Left', choosing the new disease-resistant hybrid 'Clone 762' (*Ulmus* 'Wanoux' = Vada).*[70] In the French Republican Calendar, in use from 1792 to 1806, the 12th day of the month Ventôse (= 2 March) was officially named «jour de l'Orme», Day of the Elm.

Liberty Elms were also planted in other countries in Europe to celebrate their revolutions, an example being *L'Olmo di Montepaone, L'Albero della Libertà* (:the Elm of Montepaone, Liberty Tree) in Montepaone, Calabria, planted in 1799 to commemorate the founding of the democratic Parthenopean Republic, and surviving till it was brought down by a recent storm (it has since been cloned and 'replanted').*[71] And after the Greek Revolution of 1821-32, a thousand young elms were brought to Athens from Missolonghi, "Sacred City of the Struggle" against the Turks and scene of Lord Byron's death, and planted in 1839-40 in the National Garden.*[72]*[73] In Thessaloniki a more recent Libery Elm, «Η Φτελιά της 25ης Μαρτίου» (:The Elm of 25 March), the oldest elm in the city, still stands at the beginning of 25 March Street (Οδός 25ης Μαρτίου), date of the beginning of the 1821 revolution.*[74]*[75] In an ironic development, wild elms have spread and taken over the grounds of the abandoned Greek royal summer palace at Tatoi in Attica.

- Planting a Liberty Tree (*un arbre de la liberté*) during the French Revolution. Jean-Baptiste Lesueur, 1790
- Balcony with elm symbol, overlooking the 'Crossroads of the Elm', Place Saint-Gervais, Paris*[1]
- President George W. Bush and Laura Bush planting a disease-resistant 'Jefferson' Elm before the White House, 2006
- Elm suckers spreading before the abandoned summer royal palace in Tatoi, Greece, March 2008

1. ^ Cite error: The named reference paris.fr was invoked but never defined (see the help page).

19.11 The propagation of elms

Elm propagation methods vary according to elm type and location, and the plantsman's needs. Native species may be propagated by seed. In their natural setting native species, such as wych elm and European White Elm in central and northern Europe and Field Elm in southern Europe, set viable seed in 'favourable' seasons. Optimal conditions occur after a late warm spring.*[1] After pollination, seeds of spring-flowering elms ripen and fall at the start of summer (June); they remain viable for only a few days. They are planted in sandy potting-soil at a depth of one centimetre, and germinate in three weeks. Slow-germinating American Elm will remain dormant until the second season.*[76] Seeds from autumn-flowering elms ripen in the Fall and germinate in the spring.*[76] Since elms may hybridize within and between species, seed-propagation entails a hybridisation risk. In unfavourable seasons elm seeds are usually sterile. Elms outside their natural range, such as *Ulmus procera* in England, and elms unable to pollinate because pollen-sources are genetically identical, are sterile and are propagated by vegetative reproduction. Vegetative reproduction is also used to produce genetically identical elms (clones). Methods include the winter transplanting of root-suckers; taking hardwood cuttings from vigorous one-year-old shoots in late winter,*[77] taking root-cuttings in early spring; taking softwood cuttings in early summer;*[78] grafting; layering; and micropropagation. A bottom heat of 18 degrees*[79] and humid conditions are maintained for hard- and softwood cuttings. The transplanting of root-suckers remains the easiest and commonest propagation-method for European Field Elm and its hybrids. For 'specimen' urban elms, grafting to wych-elm root-stock may be used to eliminate suckering or to ensure stronger root-growth. The mutant-elm cultivars are usually grafted, the 'weeping' elms 'Camperdown' and 'Horizontalis' at 2 – 3 m, the dwarf cultivars 'Nana' and 'Jacqueline Hillier' at ground level. Since the Siberian Elm is drought-tolerant, in dry countries new varieties of elm are often root-grafted on this species.*[80]

- Ripe seeds of Field Elm

- Rock elm *Ulmus thomasii* germinating
- Seedling of wych elm *Ulmus glabra* (photograph: Mihailo Grbić)
- Root cuttings of Ulmus 'Dodoens' (photograph: Mihailo Grbić)
- Rooted hardwood elm-cutting (photograph: Mihailo Grbić)
- Rooting of softwood elm-cuttings under mist-propagation system (photograph: Mihailo Grbić)
- Mutant variegated Smooth-leafed Elm graft (photograph: Mihailo Grbić)
- Root-suckers spreading from Field Elm *Ulmus minor*

19.12 Organisms associated with elm

- 'Pouch' leaf-galls on a wych elm (aphid *Tetraneura ulmi*), Germany.
- 'Pouch' leaf-gall on elm leaf (aphid *Tetraneura ulmi*), Netherlands.
- 'Cockscomb' leaf-galls (aphid *Colopha compressa*), Poland.
- 'Bladder' leaf-galls on elm leaves (aphid *Eriosoma lanuginosum*), Italy.
- 'Bladder' leaf-galls on a narrow-leaved elm (aphid *Eriosoma lanuginosum*), Italy.
- Aphids in leaf-gall, Poland.
- 'Pimple' leaf-galls on a field elm (mite *Eriophyes ulmi*), Spain.
- White-letter Hairstreak *Satyrium w-album*, on Lutece, Sweden. The larvae feed only on elm.
- Egg of *Satyrium w-album* near flower-bud of an elm.
- Elm-bark beetle *Scolytus multistriatus* (size: 2–3 mm), a vector for Dutch Elm Disease
- *Scolytus multistriatus* 'galleries' under elm-bark.
- Elm-leaf beetle *Xanthogaleruca luteola*, which causes serious damage to elm foliage.
- *Xanthogaleruca luteola*: caterpillar on elm-leaf, Germany.
- Elm-leaf damage caused by *Xanthogaleruca luteola*, Germany.
- Bacterial infection *Erwinia carotovora* of elm sap, which causes 'slime flux' ('wetwood') and staining of the trunk (here on a Camperdown Elm).

19.13 See also

- List of Elm cultivars, hybrids and hybrid cultivars
- List of Elm species and varieties by scientific name
- List of Lepidoptera that feed on elms
- Fab Tree Hab

19.14 References

[1] Richens, R. H. (1983). *Elm*. Cambridge University Press.

[2] Rackham, O. (1980). *Ancient woodland: its history, vegetation and uses*. Edward Arnold, London

[3] Bean, W. J. (1981). *Trees and shrubs hardy in Great Britain*, 7th edition. Murray, London

[4] Fu, L., Xin, Y. & Whittemore, A. (2002). Ulmaceae, in Wu, Z. & Raven, P. (eds) *Flora of China*, Vol. 5 (Ulmaceae through Basellaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis, USA.

[5] Brummitt, R. K. (1992). *Vascular Plant Families & Genera*. Royal Botanic Garden, Kew, London, UK.

[6] Marren, Peter, *Woodland Heritage* (Newton Abbot, 1990).

[7] Werthner, William B. (1935). *Some American Trees: An intimate study of native Ohio trees*. New York: The Macmillan Company. pp. xviii + 398.

[8] Heybroek, H. M., Goudzwaard, L, Kaljee, H. (2009). *Iep of olm, karakterboom van de Lage Landen* (:Elm, a tree with character of the Low Countries). KNNV, Uitgeverij. ISBN 9789050112819

[9] Brasier, C. M. & Mehotra, M. D. (1995). Ophiostoma himal-ulmi sp. nov., a new species of Dutch elm disease fungus endemic to the Himalayas. *Mycological Research* 1995, vol. 99 (2), pp. 205–215 (44 ref.) ISSN 0953-7562. Elsevier, Oxford, UK.

[10] Brasier, C. M. (1996). New horizons in Dutch elm disease control. Pages 20-28 in: *Report on Forest Research*, 1996. Forestry Commission. HMSO, London, UK.

[11] "Elm Yellows". Elmcare.Com. 19 Mar. 2008.

[12] Price, Terry. "Wilt Diseases". Forestpests.Org. 23 Mar. 2005. 19 Mar. 2008.

[13] Rines, George Edwin, ed. (1920). "Elm-Insects". *Encyclopedia Americana*.

[14] "Elm-Insects". *New International Encyclopedia*. 1905.

[15] Burdekin, D. A. & Rushforth, K. D. (Revised by Webber J. F. 1996). Elms resistant to Dutch elm disease. *Arboricultural Research Note* 2/96. Arboricultural Advisory and Information Service, Alice Holt, Farnham, UK.

[16] Ware, G. (1995). Little-known elms from China: landscape tree possibilities. *Journal of Arboriculture*, (Nov. 1995). International Society of Arboriculture, Champaign, Illinois, USA.

[17] Biggerstaffe, C., Iles, J. K., & Gleason, M. L. (1999). *Sustainable urban landscapes: Dutch elm disease and disease-resistant elms*. SUL-4, Iowa State University

[18] Martín-Benito D., Concepción García-Vallejo M., Pajares J. A., López D. 2005. "Triterpenes in elms in Spain". *Can. J. For. Res.* 35: 199–205 (2005).

[19] Pajares, J. A., García, S., Díez, J. J., Martín, D. & García-Vallejo, M. C. 2004. "Feeding responses by Scolytus scolytus to twig bark extracts from elms". *Invest Agrar: Sist Recur For.* 13: 217–225.

[20] Martin, J. et al. (2013). Seven Iberian Ulmus minor clones resistant to Dutch elm disease registered for their use as forest reproductive material. *Proceedings of the 3rd International Elm Conference*, Florence, 2013.

[21] "Scientific Name: Ulmus x species" (PDF). Archived from the original (PDF) on 19 September 2009. Retrieved July 2012.

[22] Santini A., Fagnani A., Ferrini F., Mittempergher L., Brunetti M., Crivellaro A., Macchioni N., "Elm breeding for DED resistance, the Italian clones and their wood properties". *Invest Agrar: Sist. Recur. For* (2004) 13 (1), 179–184. 2004.

[23] Santamour, J., Frank, S. & Bentz, S. (1995). Updated checklist of elm (Ulmus) cultivars for use in North America. *Journal of Arboriculture*, 21:3 (May 1995), 121–131. International Society of Arboriculture, Champaign, Illinois, USA

[24] Smalley, E. B. & Guries, R. P. (1993). Breeding Elms for Resistance to Dutch Elm Disease. *Annual Review of Phytopathology* Vol. 31 : 325–354. Palo Alto, California

[25] Heybroek, H. M. (1983). Resistant Elms for Europe. In Burdekin, D. A. (Ed.) Research on Dutch elm disease in Europe. *For. Comm. Bull.* 60. pp 108–113

[26] Heybroek, H. M. (1993). The Dutch Elm Breeding Program. In Sticklen & Sherald (Eds.) (1993). *Dutch Elm Disease Research*, Chapter 3. Springer Verlag, New York, USA

[27] Mittempergher, L. & Santini, A. (2004) The history of elm breeding. *Investigacion agraria: Sistemas y recursos forestales* 13(1): 161–177 (2004)

[28] Brookes, A. H. (2013). *Disease-resistant elm cultivars, Butterfly Conservation trials report, 2nd revision, 2013*. Butterfly Conservation, Hants & IoW Branch, England.

[29] Elwes, H. J. & Henry, A. (1913). *The Trees of Great Britain & Ireland*. Vol. VII. 1848–1929. Republished 2004 Cambridge University Press, ISBN 9781108069380

[30] Edlin, H. L., *Guide to Tree Planting and Cultivation* (London, 1970), p.330, p.316

[31] 'Salt-tolerant landscape plants', countyofdane.com/myfairlakes/A3877.pdf

[32] dutchtrig.com/the_netherlands/the_hague.html

[33] Hiemstra et al., (2005). *Belang en toekomst van de iep in Nederland*. Praktijkonderzoek Plant & Omgeving, Wageningen UR

[34] Michael Ventris and John Chadwick, *Documents in Mycaenean Greek*, Cambridge 1959

[35] Hesiod, *Works and Days*, 435

[36] Elm. Niche Timbers. Accessed 19-08-2009.

[37] Columella, *De Re Rustica*

[38] Ovid, *Amores* 2.16.41

[39] Virgil, *Georgica*, I.2: *ulmis adiungere vites* (:*to marry vines to elms*); Horace, *Epistolae* 1.16.3: *amicta vitibus ulmo* (:*the elm clothed in the vine*); and Catullus, *Carmina*, 62

[40] Braun, Lesley; Cohen, Marc (2006). *Herbs and Natural Supplements: An Evidence-Based Guide* (2nd ed.). Churchill Livingstone. p. 586. ISBN 978-0-7295-3796-4., quote:"Although Slippery Elm has not been scientifically investigated, the FDA has approved it as a safe demulcent substance."

[41] Maunder, M. (1988). Plants in Peril, 3. Ulmus wallichiana (Ulmaceae). *Kew Magazine*. 5(3): 137-140. Royal Botanic Garden, Kew, London.

[42] Osborne, P. (1983). The influence of Dutch elm disease on bird population trends. *Bird Study*, 1983: 27-38.

[43] D. S. Vohra (1 June 2004). *Bach Flower Remedies: A Comprehensive Study*. B. Jain Publishers. p. 3. ISBN 978-81-7021-271-3. Retrieved 2 September 2013.

[44] "Flower remedies". Cancer Research UK. Retrieved September 2013.

[45] Solla, A., Bohnens, J., Collin, E., Diamandis, S., Franke, A., Gil, L., Burón, M., Santini, A., Mittempergher, L., Pinon, J., and Vanden Broeck, A. (2005). Screening European Elms for Resistance to Ophiostoma novo-ulmi. *Forest Science* 51(2) 2005. Society of American Foresters, Bethesda, Maryland, USA.

[46] Pinon J., Husson C., Collin E. (2005). Susceptibility of native French elm clones to Ophiostoma novo-ulmi. *Annals of Forest Science* 62: 1–8

[47] Collin, E. (2001). Elm. In Teissier du Cros (Ed.) (2001) *Forest Genetic Resources Management and Conservation. France as a case study.* Min. Agriculture, Bureau des Ressources Genetiques CRGF, INRA-DIC, Paris: 38–39.

[48] Johannes Christiaan Karel Klinkenberg

[49] Athenaeus, *Δειπνοσοφισταί*, III

[50] *Iliad*, Z, 419–420, www.perseus.tufts.edu

[51] *Iliad*, Φ, 242–243, www.perseus.tufts.edu

[52] Philostratus, *Ἡρωικός*, 3,1 perseus.tufts.edu/hopper/text?doc=Perseus%3Atext%3A2008.01.0597%3Aolpage%3D672

[53] Quintus Smyrnaeus, *Τα μεθ' Ὁμηρον*, 7.458–462

[54] Pliny the Elder, *Naturalis Historia*, 16.88

[55] *Anth. Pal.*, 7.141

[56] Lucas, F. L., *From Olympus to the Styx* (London, 1934)

[57] Theocritus, *Ειδύλλιο* I, 19–23; VII, 135–40

[58] Vergil, *Aeneid*, VI. 282–5

[59] Richens, R. H., *Elm* (Cambridge 1983) p.155

[60] Richens, R. H., *Elm*, Ch.10 (Cambridge, 1983)

[61] Heybroek, H. M., 'Resistant Elms for Europe' (1982) in *Research on Dutch Elm Disease in Europe*, HMSO, London 1983

[62] Wilkinson, Gerald, *Epitaph for the Elm* (London, 1978), p.87

[63] Shakespeare, *A Midsummer Night's Dream*, Act 4, Scene 1

[64] Janssen, Carolyn. "An elm tree and three sisters (Book Review)". ebscohost. Retrieved 21 September 2012.

[65] Armstrong, J. V. & Sell, P. D. (1996). A revision of the British elms (*Ulmus* L., Ulmaceae): the historical background. *Bot. J. Linn. Soc.* 120: 39-50.

[66] Richens, *Elm* (Cambridge, 1983)

[67] elmcare.com/about_elms/history/liberty_elm_boston.htm

[68] L'Orme de La Madeleine, giuseppemusolino.it

[69] *L'Orme de St-Gervais: biographie d'un arbre*, www.paris.fr

[70] *Ulmus* 'Wanoux' (Vada)) freeimagefinder.com/detail/6945514690.html

[71] calabriaonline.com

[72] *Ο μοναδικός Εθνικός μας Κήπος*, paidevo.gr/teachers/?p=859

[73] Νίκος Μπελαβίλας, ΜΥΘΟΙ ΚΑΙ ΠΡΑΓΜΑΤΙΚΟΤΗΤΕΣ ΓΙΑ ΤΟ ΜΗΤΡΟΠΟΛΙΤΙΚΟ ΠΑΡΚΟ ΕΛΛΗΝΙΚΟΥ, courses.arch.ntua.gr/fsr/112047/Nikos_Belavilas-Mythoi_kai_Pragmatikotites

[74] *Σωτηρία φτελιάς, με τη συνδρομή των κατοίκων*, news.kathimerini.gr/4dcgi/_w_articles_ell_1_27/05/2010_402389]

[75] enet.gr/?i=news.el.article&id=298315

[76] forestry.about.com/od/treeplanting/qt/seed_elm.htm

[77] http://www.doityourself.com/stry/propagation-root-an-elm-tree-cutting

[78] cru.cahe.wsu.edu/CEPublications/pnw0152/pnw0152.html

[79] resistantelms.co.uk/elms/ulmus-morfeo/

[80] Clouston, B., Stansfield, K., eds., *After the Elm* (London, 1979)

19.15 Monographs

- Richens, R. H. (1983). *Elm*. Cambridge University Press. ISBN 0-521-24916-3 A scientific, historical and cultural study, with a thesis on elm-classification, followed by a systematic survey of elms in England, region by region. Illustrated.
- Heybroek, H. M., Goudzwaard, L, Kaljee, H. (2009). *Iep of olm, karakterboom van de Lage Landen* (:Elm, a tree with character of the Low Countries). KNNV, Uitgeverij. ISBN 9789050112819. A history of elm planting in the Netherlands, concluding with a 40 - page illustrated review of all the DED - resistant cultivars in commerce in 2009.

19.16 Further reading

- Clouston, B.; Stansfield, K., eds. (1979). *After the Elm*. London: Heinemann. ISBN 0-434-13900-9 A general introduction, with a history of Dutch elm disease and proposals for re-landscaping in the aftermath of the pandemic. Illustrated.
- Coleman, M., ed. (2009). *Wych Elm*. Edinburgh. ISBN 978-1-906129-21-7 A study of the species, with particular reference to the wych elm in Scotland and its use by craftsmen.
- Dunn, C. P., ed. (New York). *The Elms: Breeding, Conservation, and Disease-Management*. ISBN 0-7923-7724-9 Check date values in: |date= (help)
- Wilkinson, G. (1978). *Epitaph for the Elm*. London: Hutchinson. ISBN 0-09-921280-3 A photographic and pictorial celebration and general introduction.

19.17 External links

- "Elm trials". Northern Arizona University.
- Tree Family Ulmaceae Diagnostic photos of Elm species at the Morton Arboretum
- "Late 19th and early 20th-century photos of Elm species in Elwes & Henry's *Trees of Great Britain & Ireland*, v. 7" (PDF). 1913.
- "Elm Photo Gallery".
- Eichhorn, Markus (May 2010). "Elm – The Tree of Death". *Test Tube*. Brady Haran for the University of Nottingham.
- Texts on Wikisource:
  - "Elm". *The American Cyclopædia*. 1879.
-
  - "Elm". *New International Encyclopedia*. 1905.
  - "Elm". *Encyclopædia Britannica* (11th ed.). 1911.
  - "Elm". *Encyclopedia Americana*. 1920.
  - "Elm". *Collier's New Encyclopedia*. 1921.

A rooted cutting of European White Elm (July)

Chapter 20

Ulmus glabra

Ulmus glabra, the **wych elm** or **Scots elm**, has the widest range of the European elm species, from Ireland eastwards to the Urals, and from the Arctic Circle south to the mountains of the Peloponnese in Greece; it is also found in Iran. A large, deciduous tree, it is essentially a montane species, growing at elevations <1500 m, preferring sites with moist soils and high humidity.*[1] The tree can form pure forests in Scandinavia and occurs as far north as latitude 67°N at Beiarn in Norway. Wych elm has also been successfully introduced to Narsarsuaq, near the southern tip of Greenland (61°N).

The tree was by far the most common elm in the north and west of the British Isles and is now acknowledged as the only indisputably British native elm species. Owing to its former abundance in Scotland, the tree is occasionally known as the Scotch or Scots elm.

Closely related species, such as Bergmann's Elm *U. bergmanniana* and Manchurian Elm *U. laciniata*, native to north-east Asia, were once sometimes included in *Ulmus glabra*;*[2] another close relative is the Himalayan or Kashmir Elm *U. wallichiana*.

20.1 Etymology

The word *wych* has its origins in Middle English *wiche*, from the Old English *wice*, meaning pliant or supple, and which also gives us *wicker* and *weak*.

20.2 Classification

20.2.1 Subspecies

Some botanists, notably Lindquist *[3] (1931) have proposed dividing the species into two subspecies:

- *Ulmus glabra* subsp. *glabra* in the south of the species' range, with broad leaves, trees often with a short, forked trunk and a low, broad crown
- *Ulmus glabra* subsp. *montana* (Stokes) Lindqvist in the north of the species' range (northern Britain, Scandinavia), the leaves are narrower, trees commonly with a long single trunk and a tall, narrow crown.

However, there is much overlap between populations with these characters, and the distinction may be owing to environmental influence, rather than genetic variation; the subspecies are not accepted by *Flora Europaea*.*[4]

20.3 Description

The wych elm sometimes reaches heights of 40 m, typically with a broad crown where open-grown, supported by a short bole < 2 m. d.b.h. There are not normally root suckers; natural reproduction is by seed alone. The tree is notable

for its very tough, supple young shoots, which are always without the corky ridges or 'wings' characteristic of many elms. The alternate leaves are deciduous, 6–17 cm long by 3–12 cm broad, usually obovate with an asymmetric base, the lobe often completely covering the short (<5 mm) petiole; the upper surface is rough. Leaves on juvenile shoots sometimes have three or more lobes near the apex.*[5] The perfect hermaphrodite flowers appear before the leaves in early spring, produced in clusters of 10-20; they are 4 mm across on 10 mm long stems and, being wind-pollinated, are apetalous. The fruit is a winged samara 20 mm long and 15 mm broad, with a single, round, 6 mm seed in the centre, maturing in late spring.*[6]*[7]

- Young foliage and seeds of wych elm
- Wych elm leaves with extra lobes
- Wych elm flowers and nascent seeds
- Bark of wych elm, estimated age 100 years.
- Wych elm near Castle Douglas, Galloway, late April.

20.4 Pests and diseases

While the species is highly susceptible to Dutch elm disease,*[8]*[9] it is less favoured as a host by the elm bark beetles which act as vectors. Research in Spain has indicated the presence of a triterpene, alnulin, renders the tree bark less attractive to the beetle than the Field elm.*[10] Moreover, once the tree is dying, its bark is quickly colonized by the fungus *Phoma*, which radically reduces the amount of bark available for the beetle to breed on.*[11] In European trials, clones of apparently resistant trees were inoculated with the pathogen, causing 85 – 100% wilting, resulting in 68% mortality by the following year. DNA analysis by Cemagref (now Irstea) in France has determined the genetic diversity within the species is very limited, making the chances of a resistant tree evolving rather remote.*[12]

The Swedish Forest Tree Breeding Association at Källstorp produced triploid and tetraploid forms of the tree, but these proved no more resistant to Dutch elm disease than the normal diploid form. *[13]

In trials conducted in Italy, the tree was found to have a slight to moderate susceptibility to elm yellows, and a high susceptibility to the elm leaf beetle *Xanthogaleruca luteola* .*[14]

20.5 Cultivation

The wych elm is moderately shade-tolerant, but requires deep, rich soils as typically found along river valleys.*[15] However, the species is intolerant of flooding, as it is of prolonged drought.*[16] Although rarely used as a street tree owing to its shape, it can be surprisingly tolerant of urban air pollution, constricted growing conditions and severe pollarding.

As wych elm does not sucker from the roots, and any seedlings are often consumed by uncontrolled deer populations, regeneration is very restricted, limited to sprouts from the stumps of young trees. The resultant decline has been extreme, and the wych elm is now uncommon over much of its former range. It is best propagated from seed or by layering stooled stock plants, although softwood cuttings taken in early June will root fairly reliably under mist.*[17]

20.6 Notable trees

The UK Champion listed in The Tree Register of the British Isles (TROBI) is at Brahan in the Scottish Highlands;*[18] it has a girth of 703 cm (2.23 m d.b.h.) and a height of 24 m . Outside the Brighton area, among the rare survivors in the south of England (2014) is a mature tree at the University College sports ground, Abingdon Road, Oxford. Notable specimens in Edinburgh are to be found (2014) in Learmonth Gardens and The Meadows.*[19]

E. M. Forster cites a particular wych elm, one that grew at Rooks Nest, Stevenage, Hertfordshire, sixteen times in his novel *Howards End*. This tree overhangs the house of the title and is said to have a "*....girth that a dozen men could not have spanned..*" Forster describes the tree as "*...a comrade, bending over the house, strength and adventure in its roots.*" The wych elm of the novel had pigs' teeth embedded in the trunk by country people long ago and it was

Wych elms flanking the Scott Monument, Princes Street Gardens, Edinburgh, 2010

said that chewing some of the bark could cure toothache. In keeping with the novel's epigraph, "*Only connect...*" , the wych elm may be seen by some as a symbol of the connection of humans to the earth. Margaret, the novel's protagonist, fears that any "*....westerly gale might blow the wych elm down and bring the end of all things...*" The tree is changed to a chestnut in the 1991 film adaptation of *Howards End*.

In 1998, over 700 healthy, mature trees were discovered on the upper slopes of Mount Šimonka in Slovakia, but it is now believed they had survived courtesy of their isolation from disease-carrying beetles rather than any innate

resistance; 50 clones of these trees were presented to HRH The Prince of Wales for planting at his Highgrove Estate, and at Clapham, Yorkshire .

20.7 Cultivars

About 40 cultivars have been raised, although at least 30 are now probably lost to cultivation as a consequence of Dutch elm disease and/or other factors:

Camperdown elm, cultivated in Prospect Park, Brooklyn, New York

- Albo-Variegata, Camperdownii (Camperdown elm), Cebennensis (Cevennes elm), Cornuta, Corylifolia, Corylifolia Purpurea, Crispa, Crispa Aurea, Dovaei, Escaillard, Fastigiata macrophylla, Fastigiata stricta, Fastigiata variegata, Firma, Flava, Gittisham, Holgeri, Horizontalis (weeping elm), Insularis, Latifolia Aurea, Latifolia Aureo-Variegata, Latifolia Nigricans, Luteo Variegata, Lutescens (golden wych elm), Macrophylla, Maculata, Minor, Monstrosa, Nigra (black Irish elm), Oblongata, Pendula Macrophylla, Pendula Variegata, Ramulosa, Rubra, Rugosa, Spectabilis, Tiliaefolia, Tomentosa.

Some elm cultivars of unconfirmed derivation, such as the Exeter Elm and the dwarf elm 'Nana', were classified until recently as forms of *U. glabra*.

20.8 Hybrids and hybrid cultivars

U. glabra hybridises naturally with *U. minor*, producing elms of the *Ulmus* × *hollandica* group, from which there have arisen a number of cultivars:

- Alba, Angustifolia, Belgica (Belgian Elm), Balder, Bea Schwarz, Blandford, Cinerea, Dampieri, Dauvessei, Daveyi (Davey Elm), Dumont, Eleganto-Variegata, Elegantissima, Fjerrestad, Freja, Fulva, Gaujardii, Haarlemensis, Hillieri, Jacqueline Hillier, Loke, Major (Dutch Elm), Macrophylla Aurea, Microphylla, Modiolina, Muscaviensis, Odin, Pioneer, Serpentina, Smithii (Downton Elm), Superba (Canterbury Elm), Tricolor, Tyr. Vegeta (Huntingdon Elm) / Vegeta (Chichester Elm), Virens (Kidbrook Elm), Viscosa, Wredei (Golden Elm), Ypreau.

A crossing in Russia of *U. glabra* and *U. pumila*, the Siberian Elm, produced the hybrid *Ulmus* × *arbuscula*.

Hybrids with *U. glabra* in their ancestry have featured strongly in recent artificial hybridization experiments in Europe, notably at Wageningen in the Netherlands, and a number of hybrid cultivars have been commercially released since 1960.*[20] The earlier trees were raised in response to the initial Dutch elm disease pandemic that afflicted Europe after the First World War, and were to prove vulnerable to the much more virulent strain of the disease that arrived in the late 1960s. However, further research eventually produced several trees effectively immune to disease, which were released after 1989.*[21]

- Arno, Clusius, Columella, Commelin, Den Haag, Dodoens, Groeneveld, Homestead, Lobel, Nanguen = LUTECE, Pioneer, Plinio, Regal, San Zanobi, Urban, Warnoux = VADA.

20.9 Accessions

North America

- Arnold Arboretum. Acc. no. 391-2001, wild collected in Georgia
- Bartlett Tree Experts. Acc. nos. 1505, 5103, origin undisclosed
- Dawes Arboretum , Newark, Ohio. 6 trees, no acc. details available
- Missouri Botanical Garden , St. Louis, Missouri. Acc. nos. 1969-6164, 1986-0160
- Morton Arboretum. Acc. nos. 591-54, 255-81, and by its synonym *U. sukaczevii*, acc. nos. 949-73, 181-76

Australasia

- Avenue of Honour, Ballarat, Australia, details not known.
- Eastwoodhill Arboretum , Gisborne, New Zealand, 8 trees, details are not known.

20.10 Nurseries

North America

Only as cultivar 'Camperdownii' (Camperdown elm)

Europe

Widely available - in the UK, nurseries stocking this tree can be found by using the plantfinder function of the Royal Horticultural Society's website. This tree is also stocked by many local nurseries and by the British Trust for Conservation Volunteers.

20.11 Further reading

- Coleman, Max, ed.: *Wych Elm* (Edinburgh, 2009; ISBN 978-1-906129-21-7). A study of the species, with particular reference to the wych elm in Scotland and its use by craftsmen.

20.12 References

[1] Heybroek, H. M., Goudzwaard, L, Kaljee, H. (2009). *Iep of olm, karakterboom van de Lage Landen* (:Elm, a tree with character of the Low Countries). KNNV, Uitgeverij. ISBN 9789050112819

[2] Elwes, H. J. & Henry, A. (1913). *The Trees of Great Britain & Ireland*. Vol. VII. 1848–1929. Republished 2014 Cambridge University Press, ISBN 9781108069380

[3] Lindquist, B. (1931). Two varieties of North West European Ulmus glabra. *Bot. Exch. Club Rep.*

[4] Flora Europaea: *Ulmus glabra*

[5] Coleman, M (ed.). (2009). *Wych Elm*. Royal Botanic Garden Edinburgh. ISBN 978-1-906129-21-7.

[6] Bean, W. J. (1981). *Trees and shrubs hardy in Great Britain*, 7th edition. Murray, London.

[7] White, J. & More, D. (2003). *Trees of Britain and Northern Europe*. Cassell's, London

[8] Forestry Commission. *Dutch elm disease in Britain*, UK

[9] Brasier, C. M. (1996). New horizons in Dutch elm disease control. Pages 20–28 in: *Report on Forest Research*, 1996. Forestry Commission. HMSO, London, UK.

[10] Martín-Benito D., Concepción García-Vallejo M., Alberto Pajares J., López D. 2005. Triterpenes in elms in Spain. *Can. J. For. Res.* 35: 199–205 (2005).

[11] Webber, J. (1980). A natural biological control of Dutch elm disease. *Nature*, 292, 449-451

[12] Solla et al. (2005). Screening European Elms for Resistance to Ophiostoma novo-ulmi. *Forest Science*, 134–141. 51 (2) 2005. Society of American Foresters.

[13] Went, J. (1954). The Dutch Elm Disease - Summary of fifteen years' hybridization and selection work (1937–1952). *European Journal of Plant Pathology*. 02(1954); 60(2): 109–1276.

[14] Mittempergher, L. & Santini, A. (2004). The History of Elm Breeding. *Invest. Agrar.: Sist Recur For. 2004 13 (1), 161-177.*

[15] Edlin, H. L. (1949). *British woodland trees*. Batsford, London.

[16] CAB International (2005) *Forestry Compendium*. CAB International, Wallingford, UK

[17] Beckett, K. & G. (1979). *Planting Native Trees and Shrubs*. Jarrold & Sons, Norwich, UK.

[18] The Brahan Elm, forestry.gov.uk

[19] Edinburgh Wych-elm photographs

[20] Green, P. S. (1964). Registration of cultivar names in Ulmus. *Arnoldia*. Vol. 24. Arnold Arboretum, Harvard University.

[21] Heybroek, H. (1983). The Dutch elm breeding program. In Sticklen & Sherald (Eds). *Dutch elm disease research* (Ch. 3). Springer Verlag, New York.

20.13 External links

- *Ulmus glabra* distribution map: linnaeus.nrm.se
- http://northernontarioflora.ca/chklst.cfm?speciesid=1005114 Synonymy list.
- http://en.sl.life.ku.dk/Faciliteter/GroenlandsArboretet/Skovplantninger.aspx The Forest Plantations (Greenland)

Chapter 21

Ulmus minor subsp. minor

Ulmus minor* subsp. *minor Richens, the **Smooth-leaved Elm**, **Narrow-leafed Elm** or **East Anglian Elm**, is a subspecies of the Field Elm native to southern Europe and Asia Minor including Iran.

The name *Ulmus minor* subsp. *minor* was used by R. H. Richens [*][1] for Field Elm that was not English Elm, Cornish Elm, Lock Elm or Guernsey Elm. Many publications, however, continue to use plain *Ulmus minor* for Richens's *Ulmus minor* subsp. *minor*. Indeed Dr Max Coleman of Royal Botanic Garden Edinburgh argued in his 2002 paper 'British Elms' that there was no clear distinction between species and subspecies.[*][2]

21.1 Description

The Smooth-leaved Elm is a deciduous tree that can grow to 35 m. Its Latin synonym *carpinifolia* alludes to the superficial similarity of the leaves to those of Hornbeam *Carpinus sp.*, while the common names contrast the smooth upper surface and narrowness of the leaves with those of the Wych Elm, which are rough and broad.[*][3][*][4] The apetalous perfect wind-pollinated flowers, and fruit (samarae) are very similar to those of the species.

21.2 Pests and diseases

Although the Smooth-leafed Elm is generally susceptible to Dutch elm disease, it is genetically a highly variable tree and it is possible some specimens survive in the UK owing to an innately high level of resistance (see Cultivation). Research currently (2009) in hand by Cemagref at Le Pepiniére forestiére de l'Etat, Guémené-Penfao, France, should confirm this. However, all Smooth-leafed Elm varieties are believed to have been introduced into Britain from central and southern Europe during the Bronze Age,[*][5] and some, being beyond their natural climates and environments, may be growing slowly and thus producing smaller springwood vessels restrictive to the *Ophiostoma* fungus. Good performance in the field may also be owing to resistance to bark beetle feeding or breeding. Moreover, several types of this subspecies also have very pendulous twigs when mature, a factor which could also make them unattractive to foraging Scolytus beetles, which are disinclined to invert themselves.[*][6]

As the tree suckers readily, its genetic resources are not considered endangered.[*][7]

The subspecies has a moderate to high susceptibility to the elm leaf beetle *Xanthogaleruca luteola* , and a moderate susceptibility to Elm Yellows.[*][8]

21.3 Cultivation

Many mature specimens still survive in England, notably in East Anglia.[*][9][*][10] Here, the elms on the isolated Dengie peninsula in Essex, still thriving in the 1980s when Professor Oliver Rackham made his study,[*][11] continue to fare better than most. The Woodland Trust currently lists (2013) some 120 surviving "ancient" smooth-leaved elms in England and Wales,[*][12] some of which are among the elms now being cloned, propagated and planted as part of The Conservation Foundation's 'Great British Elm Experiment' and 'Ulmus londinium' projects, a scheme to

Four great East Anglian elms, Ulmus minor *subsp.* minor*, tower over an oak (left) and a two-storey house, Badingham, Suffolk, 1984*

Narrow-leaved elms near Tillingham, Dengie peninsula, 2010

identify disease-resistant strains and return elms to city and countryside.[*][13][*][14]

In a more academically-based project, most of the clones of the surviving European Field Elms that have been tested since the 1990s for innate resistance to Dutch elm disease by national research institutes in the EU, with a view to

returning Field Elm to cultivation in Europe,*[15] would be classified by Richens' s system as *Ulmus minor* subsp. *minor*. Results from Spain (2013), for example, confirm that a very small number of surviving Field Elms (about 0.5% of those tested) appear to have comparatively high levels of tolerance of the disease, and it is hoped that a controlled crossing of the best of these will produce resistant *Ulmus minor* hybrids for cultivation.*[16]

Independent nurserymen are also starting to cultivate narrow-leaved elm again. Clones of two mature *Ulmus minor* subsp. *minor* that survive in Essex and that are believed, but not scientifically proven, to have some innate resistance to Dutch Elm Disease, are now available commercially. In the early 1990s, Paul King of King & Co. nursery took and potted cuttings, and over the next decade, as the original trees were still healthy, saplings were cultivated by micropropagation and offered for sale.*[17]*[18]

Narrow-leaved elm was occasionally planted as an ornamental urban tree.

21.4 Notable trees

The largest recorded tree in the UK grew at Amwell, Herts., measuring 40 m in height and 228 cm d.b.h. in 1911.*[19] Another famous specimen was the great elm that towered above its two siblings at the bottom of Long Melford Green, Long Melford, Suffolk,*[20] till the group succumbed to disease in 1978. The three "were survivors of a former clone of at least nine elms, one dating from 1757".*[21] The Long Melford elms were painted in 1940 by the watercolourist S. R. Badmin in his 'Long Melford Green on a Frosty Morning', now in the Victoria and Albert Museum.*[22]

The largest known surviving trees are at East Coker, Somerset (30 m high, 95 cm d.b.h.), Termitts Farm near Hatfield Peverel, Essex (25 m high, 145 d.b.h.), Scrub Wood near Little Baddow, Essex (30 m high), and Melchbourne, Bedfordshire, (147 cm d.b.h.).*[23]

21.5 Cultivars

- Variegata (Variegated Smooth-leafed Elm)

21.6 Hybrids

The tree's natural range in eastern England overlaps with that of Wych Elm (*Ulmus glabra*), the two species hybridizing to produce elms of the *Ulmus* × *hollandica* type. *U. minor* subsp. *minor* is believed to have hybridized also with Plot's Elm (*Ulmus minor* var. *plotii*) to create *Ulmus* × *viminalis*.

21.7 Accessions

21.7.1 North America

- Brooklyn Botanic Garden , New York, acc. nos. 350001, X02487 (as *U. carpinifolia*).
- Dawes Arboretum , Newark, Ohio. 3 trees, listed as *U. carpinifolia*, no acc. details available.
- Dominion Arboretum, Ottawa, Canada. Listed as *U. carpinifolia*. No acc. details available.

21.7.2 Europe

- Brighton & Hove City Council, NCCPG elm collection holders .
- Royal Botanic Garden, Wakehurst Place, as *U. carpinifolia* Gled., acc. nos. 1975-6201, 1977-6682, collected by Melville.

21.8 Nurseries

21.8.1 North America

None known.

21.8.2 Europe

- Eggleston Hall Gardens,
- Firecrest Tree & Shrub Nursery,
- Trees & Hedges,
- King & Co, The Tree Nursery, Rayne, Essex

21.8.3 Australasia

- Established Tree Planters Pty. Ltd., Wandin, Victoria, Australia. , as *U. carpinifolia*.

21.9 References

[1] Richens, R. H., *Elm* (Cambridge 1983), p.280

[2] Coleman M. (2002) 'British elms.' *British Wildlife* 13 (6): 390-395.

[3] Stace, C. A. (1997). *New Flora of the British Isles*, 2nd edition. Cambridge University Press.

[4] White, J. & More, D. (2003). *Trees of Britain & Northern Europe*. Cassell's, London.

[5] Richens, R. H. (1983). *Elm*. Cambridge University Press.

[6] Webber, J. (2008). Dutch elm disease in Britain. *Forest Research*, Forestry Commission, Alice Holt, Farnham, Surrey

[7] Collin, E., Bilger, I., Eriksson, G. & Turok, J. (2000). The conservation of elm genetic resources in Europe, in Dunn, C. P., (Ed.) (2000) *The Elms: Breeding, Conservation and Disease Management*. Kluwer Academic Publishers, Boston, USA.

[8] Mittempergher, L. & Santini, A. (2004). The History of Elm Breeding. *Invest. Agrar.: Sist Recur For. 2004 13 (1), 161-177.*

[9] Miles, A. (2007) *Hidden Trees of Britain*. Ebury Press.

[10] Gibbs, J. N., Brasier, C. M., Webber, J. F. (1994) Dutch elm disease in Britain. *Forestry Commission Research Note No. 252.*

[11] Oliver Rackham, *A History of the Countryside* (London, 1986)

[12] The Woodland Trust, Tree Search,

[13] conservationfoundation.co.uk

[14] northamptonchron.co.uk

[15] *Screening European Elms for resistance to 'Ophiostoma novo-ulmi'* (*Forest Science* 2005)

[16] 'Spanish Clones' (Oct. 2013) resistantelms.co.uk,

[17] dailymail.co.uk

[18] gazette-news.co.uk

[19] Elwes, H. J. & Henry, A. (1913). *The Trees of Great Britain & Ireland*. Vol. VII. 1848–1929. Republished 2004 Cambridge University Press, ISBN 9781108069380

[20] Photograph of the great elms on Long Melford Green (Francis Frith Collection, images.francisfrith.com)

[21] Photograph, plate XXI(h), in Oliver Rackham, *A History of the Countryside* (London, 1986), p.236.

[22] S. R. Badmin's 'Long Melford Green on a Frosty Morning', Victoria and Albert Museum

[23] Tree Register Of the British Isles (TROBI)

Chapter 22

Crataegus

Crataegus /krəˈtiːgəs/,[*][3] commonly called **hawthorn**, **thornapple**,[*][4] **May-tree**,[*][5] **whitethorn**,[*][5] or **haw-berry**, is a large genus of shrubs and trees in the family Rosaceae, native to temperate regions of the Northern Hemisphere in Europe, Asia and North America. The name "hawthorn" was originally applied to the species native to northern Europe, especially the common hawthorn *C. monogyna*, and the unmodified name is often so used in Britain and Ireland. The name is now also applied to the entire genus and to the related Asian genus *Rhaphiolepis*. The name **haw**, originally an Old English term for hedge, applies to the fruit.[*][6]

22.1 Description

Plant of Crataegus monogyna

Crataegus species are shrubs or small trees, mostly growing to 5–15 metres (16–49 ft) tall,[*][6] with small pome fruit and (usually) thorny branches. The most common type of bark is smooth grey in young individuals, developing shallow longitudinal fissures with narrow ridges in older trees. The thorns are small sharp-tipped branches that arise

Close-up of the flowers of C. monogyna

either from other branches or from the trunk, and are typically 1–3 cm long (recorded as up to 11.5 centimetres (4.5 in) in one case*[6]). The leaves grow spirally arranged on long shoots, and in clusters on spur shoots on the branches or twigs. The leaves of most species have lobed or serrate margins and are somewhat variable in shape. The fruit, sometimes known as a "haw", is berry-like but structurally a pome containing from 1 to 5 pyrenes that resemble the "stones" of plums, peaches, etc., which are drupaceous fruit in the same subfamily.

22.2 Ecology

Hawthorns provide food and shelter for many species of birds and mammals, and the flowers are important for many nectar-feeding insects. Hawthorns are also used as food plants by the larvae of a large number of Lepidoptera species; see List of Lepidoptera that feed on hawthorns. Haws are important for wildlife in winter, particularly thrushes and waxwings; these birds eat the haws and disperse the seeds in their droppings.

22.3 Uses

22.3.1 Culinary use

The "haws" or fruits of the Common Hawthorn, *C. monogyna*, are edible but the flavour has been compared to over-ripe apples. In the United Kingdom they are sometimes used to make a jelly or home made wine.*[7] The leaves are edible and, if picked in spring when still young, are tender enough to be used in salads.*[8] The young leaves and flower buds, which are also edible, are known as "bread and cheese" in rural England.*[7]

The fruits of the species *Crataegus pinnatifida* (Chinese hawthorn) are tart, bright red, and resemble small crabapple fruits. They are used to make many kinds of Chinese snacks, including haw flakes and *tanghulu* (糖葫芦). The fruits, which are called *shānzhā* (山楂) in Chinese, are also used to produce jams, jellies, juices, alcoholic beverages, and other drinks . In South Korea, a liquor called *sansachun* (□□□) is made from the fruits.

The fruits of *Crataegus mexicana* are known in Mexico as *tejocotes* and are eaten raw, cooked, or in jam during the winter months. They are stuffed in the *piñatas* broken during the traditional pre-Christmas celebration known as *Las Posadas*. They are also cooked with other fruits to prepare a Christmas punch. The mixture of *tejocote* paste, sugar, and chili powder produces a popular Mexican candy called *rielitos*, which is manufactured by several brands.

In the southern United States fruits of three native species are collectively known as mayhaws and are made into jellies which are considered a great delicacy. The Kutenai people of northwestern North America used red and black hawthorn fruit for food.*[9]

On Manitoulin Island in Canada, some red-fruited species are called **hawberries**. They are common there thanks to the island's alkaline soil. During the pioneer days, white settlers ate these fruits during the winter as the only remaining food supply. People born on the island are now called "haweaters". In Iran, the fruits of *Crataegus* (including *Crataegus azarolus* var. *aronia*, as well as other species) are known as *zalzalak* and are eaten raw as a snack, or made into a jam known by the same name.

22.3.2 Traditional medicine and research

Several species of hawthorn have been used in traditional medicine, and there is considerable interest in testing hawthorn products for evidence-based medicine. The products being tested are often derived from *C. monogyna*, *C. laevigata*, or related *Crataegus* species, "collectively known as hawthorn",*[10] not necessarily distinguishing between these species, which are very similar in appearance.*[6] The dried fruits of *Crataegus pinnatifida* (called *shān zhā* in Chinese) are used in naturopathic medicine and traditional Chinese medicine, primarily as a digestive aid. A closely related species, *Crataegus cuneata* (Japanese hawthorn, called *sanzashi* in Japanese) is used in a similar manner. Other species (especially *Crataegus laevigata*) are used in herbal medicine where the plant is believed to strengthen cardiovascular function.*[11]

The Kutenai people of northwestern North America used black hawthorn fruit (Kutenai language: ka∓a; approximate pronunciation: *kasha*) for food,*[9] and red hawthorn fruit (Kutenai language: ∓up∓i; approximate pronunciation: *shupshi*) in traditional medicine.*[12]

Active ingredients found in hawthorn include tannins, flavonoids (such as vitexin, rutin, quercetin, and hyperoside), oligomeric proanthocyanidins (OPCs, such as epicatechin, procyanidin, and particularly procyanidin B-2), flavone-C, triterpene acids (such ursolic acid, oleanolic acid, and crataegolic acid), and phenolic acids (such as caffeic acid, chlorogenic acid, and related phenolcarboxylic acids). Standardization of hawthorn products is based on content of flavonoids (2.2%) and OPCs (18.75%).*[13]*[14]

Crataegus monogyna *'Crimson Cloud' in Elko Nevada*

Human studies

A 2008 Cochrane Collaboration meta-analysis of previous studies concluded that there is evidence of "a significant benefit in symptom control and physiologic outcomes" for an extract of hawthorn in treating chronic heart failure.*[15] A 2010 review*[16] concluded that "Crataegus [hawthorn] preparations hold significant potential as a useful remedy in the treatment of cardiovascular disease (CVD)". The review indicated the need for further study of the best dosages and concluded that although "many different theoretical interactions between *Crataegus* and orthodox medications

have been postulated ... none have [yet] been substantiated.*[16]

Several earlier pilot studies assessed the ability of hawthorn to help improve exercise tolerance in people with NYHA class II cardiac insufficiency compared to placebo. One experiment, at (300 mg/day) for 4 to 8 weeks, found no difference from placebo. The second study, including 78 subjects (600 mg/day) for 8 weeks, found "significant improvement in exercise tolerance" and lower blood pressure and heart rate during exercise. The third, including 32 subjects (900 mg/day) for 8 weeks, found improved exercise tolerance as well as a reduction in the "incidence and severity of symptoms such as dyspnea" and fatigue decreased by approximately 50%.*[10]

In the 2004 HERB-CHF (Hawthorn Extract Randomized Blinded Chronic HF Study) clinical study, 120 patients took 450 mg of hawthorn extract twice daily for six months in combination with standard therapy and a standardized exercise program. "No effects of hawthorn were seen on either quality-of-life endpoint (Tables 1 and 2), or when adjusted for LVEF".*[17]

One research program, consisting of 1,011 patients taking one tablet (standardized to 84.3 mg procyanidin) twice daily for 24 weeks, found "improvements in clinical symptoms (such as fatigue, palpitations, and exercise dyspnea), performance and exercise tolerance test, and ejection fraction".*[18]

Side effects

Overdose can cause cardiac arrhythmia and dangerously low blood pressure. Milder side effects include nausea and sedation.*[19] Patients taking Digoxin should avoid taking hawthorn.*[20]*[21]

22.3.3 Landscaping

Many species and hybrids are used as ornamental and street trees. The common hawthorn is extensively used in Europe as a hedge plant. During the British Agricultural Revolution in the 18th and 19th centuries, hawthorn saplings were mass propagated in nurseries to create the new field boundaries required by the Inclosure Acts.*[22] Several cultivars of the Midland hawthorn *C. laevigata* have been selected for their pink or red flowers. Hawthorns are among the trees most recommended for water conservation landscapes.

22.3.4 Grafting

Hawthorn can be used as a rootstock in the practice of grafting. It is graft-compatible with *Mespilus* (medlar), and with pear, and makes a hardier rootstock than quince, but the thorny suckering habit of the hawthorn can be problematic.*[6]

Seedlings of *Crataegus monogyna* have been used to graft multiple species on the same trunk, such as Pink hawthorn, pear tree and medlar, the result being trees which give pink and white flowers in May and fruits during the summer. "Chip budding" has also been performed on hawthorn trunks in order to have branches of several varieties on the same tree. Such trees can be seen in Vigo, Spain, and in the northwest of France (mainly in Brittany).

22.3.5 Bonsai

Many species of Hawthorn make excellent bonsai trees.*[23] They are grown and enjoyed for their display of flowers.

22.3.6 Other uses

The wood of some hawthorn species is very hard and resistant to rot. In rural North America it was prized for use as tool handles and fence posts.

22.4 Folklore

The saying "Ne'er cast a cloot til Mey's oot" conveys a warning not to shed any cloots (clothes) before the summer has fully arrived and the may flowers (hawthorn blossoms) are in full bloom.*[24]*[25]

Hawthorn rootstock on a medlar tree in Totnes, United Kingdom.

*[26] The custom of employing the flowering branches for decorative purposes on 1 May is of very early origin; but since the adoption of the Gregorian calendar in 1752, the tree has rarely been in full bloom in England before the second week of that month. In the Scottish Highlands the flowers may be seen as late as the middle of June. The hawthorn has been regarded as the emblem of hope, and its branches are stated to have been carried by the ancient Greeks in wedding processions, and to have been used by them to deck the altar of Hymenaios. The supposition that the tree was the source of Jesus's crown of thorns doubtless gave rise around 1911 to the tradition among the French peasantry that it utters

groans and cries on Good Friday, and probably also to the old popular superstition in Great Britain and Ireland that ill-luck attended the uprooting of hawthorns. Branches of Glastonbury Thorn, (*C. monogyna* 'Biflora',*[6] sometimes called *C. oxyacantha* var. *praecox*), which flowers both in December and in spring, were formerly highly valued in England, on account of the legend that the tree was originally the staff of Joseph of Arimathea.

Robert Graves, in his book The White Goddess.*[5] traces and reinterprets many European legends in which the whitethorn (hawthorn), also called the May-tree, is central.

In Celtic lore, the hawthorn plant was used commonly for inscriptions along with Yew and Apple. It was once said to heal the broken heart. In Ireland, the red fruit is, or was in living memory, called the Johnny MacGorey or Magory.

Serbian and Croatian folklore notes hawthorn (Serbian *глог* / *glog*, Croatian *glog*) is particularly deadly to vampires, and stakes used for their slaying must be made from the wood of the thorn tree.

In Gaelic folklore, hawthorn (in Scottish Gaelic, *Sgitheach* and in Irish, *sceach*) 'marks the entrance to the otherworld' and is strongly associated with the fairies.*[27] Lore has it that it is very unlucky to cut the tree at any time other than when it is in bloom; however, during this time it is commonly cut and decorated as a May Bush (see Beltane).*[28] This warning persists to modern times; it has been questioned by folklorist Bob Curran whether the ill luck of the De Lorean Motor Company was associated with the destruction of a fairy thorn to make way for a production facility.*[29]

Hawthorn trees are often found beside clootie wells; at these types of holy wells they are sometimes known as 'rag trees', for the strips of cloth which are tied to them as part of healing rituals.*[30] 'When all fruit fails, welcome haws' was once a common expression in Ireland.

The Glastonbury Thorn, *Crataegus monogyna* 'Biflora', which flowers twice annually, was according to a Medieval legend, supposed to have miraculously grown from a walking stick planted by Joseph of Arimathea at Glastonbury in Somerset, England. The original tree was destroyed in the 16th century during the English Reformation, but several cultivars have survived. Since the reign of King James I, it has been a Christmas custom to send a sprig of Glastonbury Thorn flowers to the Sovereign, which is used to decorates the Royal Family's dinner table.*[31]

22.5 Propagation

Although it is commonly stated that hawthorns can be propagated by cutting, this is difficult to achieve with rootless stem pieces. Small plants or suckers are often transplanted from the wild. Seeds require stratification and take one or two years to germinate.*[32] Seed germination is improved if the pyrenes that contain the seed are subjected to extensive drying at room temperature, before stratification.*[33] Uncommon forms can be grafted onto seedlings of other species.*[32]

22.6 Taxonomy

The number of species in the genus depends on taxonomic interpretation. Some botanists in the past recognised a thousand or more species,*[34] many of which are apomictic microspecies. It is estimated that a reasonable number is 200 species,*[6] but it is not yet clear how many species should be recognized because "a large portion of the synonymy, especially in North American *Crataegus*, has not been worked out." *[35]

22.7 Selected species

Main articles: List of hawthorn species with yellow fruit and List of hawthorn species with black fruit

- *Crataegus aemula* – Rome hawthorn
- *Crataegus aestivalis* – May hawthorn
- *Crataegus altaica* – Altai hawthorn
- *Crataegus ambigua* – Russian hawthorn

- *Crataegus ambitiosa* – Grand Rapids hawthorn
- *Crataegus anamesa* – Fort Bend hawthorn
- *Crataegus ancisa* – Mississippi hawthorn
- *Crataegus annosa* – Phoenix City hawthorn
- *Crataegus apiomorpha* – Fort Sheridan hawthorn
- *Crataegus aprica* – sunny hawthorn
- *Crataegus arborea* – Montgomery hawthorn
- *Crataegus arcana* – Carolina hawthorn
- *Crataegus ater* – Nashville hawthorn
- *Crataegus austromontana* – valley head hawthorn
- *Crataegus azarolus* – Azarole hawthorn
- *Crataegus berberifolia* – barberry hawthorn
- *Crataegus biltmoreana* – Biltmore hawthorn
- *Crataegus boyntonii* – stinking hawthorn
- *Crataegus brachyacantha* – blueberry haw
- *Crataegus brainerdii* – Brainerd's hawthorn
- *Crataegus calpodendron* – late hawthorn
- *Crataegus canbyi*
- *Crataegus chlorosarca*
- *Crataegus chrysocarpa* – fireberry hawthorn
- *Crataegus coccinea* – scarlet hawthorn
- *Crataegus coccinioides* – Kansas hawthorn
- *Crataegus collina* – hillside hawthorn
- *Crataegus compta* – adorned hawthorn
- *Crataegus crus-galli* – cockspur thorn
- *Crataegus cuneata* – Japanese hawthorn
- *Crataegus cupulifera*
- *Crataegus dahurica*
- *Crataegus douglasii* – black hawthorn, Douglas hawthorn
- *Crataegus ellwangeriana*
- *Crataegus erythropoda* – cerro hawthorn
- *Crataegus flabellata* – Gray’ s hawthorn
- *Crataegus flava* – yellow-fruited hawthorn
- *Crataegus fontanesiana*
- *Crataegus harbisonii* – Harbison's hawthorn
- *Crataegus heldreichii*

- *Crataegus heterophylla* – various-leaved hawthorn
- *Crataegus holmesiana* – Holmes' hawthorn
- *Crataegus hupehensis*
- *Crataegus intricata* – thicket hawthorn, intricate hawthorn
- *Crataegus iracunda* – stolon–bearing hawthorn
- *Crataegus jackii*
- *Crataegus jonesae*
- *Crataegus laevigata* – Midland hawthorn, English hawthorn
- *Crataegus lepida*
- *Crataegus macrosperma* – big-fruit hawthorn
- *Crataegus marshallii* – parsley-leaved hawthorn
- *Crataegus maximowiczii*
- *Crataegus mercerensis*
- *Crataegus mexicana* – tejocote, Mexican hawthorn
- *Crataegus mollis* – downy hawthorn
- *Crataegus monogyna* – common hawthorn
- *Crataegus nigra* – Hungarian hawthorn
- *Crataegus okanaganensis* – Okanagan Valley hawthorn
- *Crataegus orientalis* – Eastern thorn, silver thorn
- *Crataegus pedicellata* – scarlet hawthorn
- *Crataegus pentagyna* – small-flowered black hawthorn
- *Crataegus peregrina*
- *Crataegus phaenopyrum* – Washington hawthorn
- *Crataegus phippsii*
- *Crataegus pinnatifida* – Chinese hawthorn
- *Crataegus pratensis* – prairie hawthorn
- *Crataegus pruinosa* – frosted hawthorn
- *Crataegus pulcherrima* – beautiful hawthorn
- *Crataegus punctata* – dotted hawthorn, white hawthorn: the state flower of Missouri*[36]
- *Crataegus putnamiana*
- *Crataegus pycnoloba*
- *Crataegus rhipidophylla*
- *Crataegus rivularis* – river hawthorn
- *Crataegus saligna* – willow hawthorn
- *Crataegus sanguinea* – redhaw hawthorn, Siberian hawthorn
- *Crataegus sargentii* – Sargent's hawthorn

- *Crataegus scabrida* – rough hawthorn
- *Crataegus scabrifolia*
- *Crataegus songarica*
- *Crataegus spathulata* – littlehip hawthorn
- *Crataegus submollis* – Quebec hawthorn
- *Crataegus succulenta* – fleshy hawthorn
- *Crataegus tanacetifolia* – tansy–leaved thorn
- *Crataegus tracyi* – Tracy hawthorn
- *Crataegus triflora* – three-flowered hawthorn
- *Crataegus uniflora* – one-flowered hawthorn, dwarf hawthorn
- *Crataegus viridis* – green hawthorn, including cultivar 'Winter King'
- *Crataegus visenda*
- *Crataegus vulsa* – Alabama hawthorn
- *Crataegus wattiana*
- *Crataegus wilsonii* – Wilson Hawthorn

22.7.1 Selected hybrids

- *Crataegus* × *ariifolia* (= *C. ariaefolia*)
- *Crataegus arnoldiana*
- *Crataegus* × *dsungarica*
- *Crataegus* × *grignonensis* Grignon hawthorn, an unpublished name
- *Crataegus* × *lavallei* Lavallée hawthorn, including *Crataegus* × *carrieri*
- *Crataegus* × *macrocarpa*
- *Crataegus* × *media* the name for *C. monogyna–C. laevigata* hybrids
- *Crataegus* × *mordenensis* Morden hawthorn, including 'Toba' and 'Snowbird'
- *Crataegus* × *sinaica* - Za'rur
- *Crataegus* × *smithiana* Red Mexican hawthorn, an unpublished name
- *Crataegus* × *vailiae*

22.8 References

[1] Potter, D., et al. (2007). Phylogeny and classification of Rosaceae. *Plant Systematics and Evolution*. 266(1–2): 5–43. [Referring to the subfamily by the name "Spiraeoideae"]

[2] J. B. Phipps (1997). *Monograph of northern Mexican* Crataegus *(Rosaceae, subfam. Maloideae)*. Sida, Botanical Miscellany **15**. Botanical Research Institute of Texas. p. 12. ISBN 9781889878294.

[3] *Sunset Western Garden Book,* 1995:606–607

[4] Voss, E.G. 1985. *Michigan Flora: A guide to the identification and occurrence of the native and naturalized seed-plants of the state. Part II: Dicots (Saururaceae–Cornaceae)*. Cranbrook Institute of Science and University of Michigan Herbarium, Ann Arbor, Michigan, U.S.A.

[5] Graves, Robert. *The White Goddess: A Historical Grammar of Poetic Myth*, 1948, amended and enlarged 1966, New York: Farrar, Straus and Giroux.

[6] Phipps, J.B., O'Kennon, R.J., Lance, R.W. (2003). *Hawthorns and medlars*. Royal Horticultural Society, Cambridge, U.K.

[7] [Wright, John (2010), *Hedgerow: River Cottage Handbook* Bloomsbury Publishing Plc, ISBN 978-1-4088-0185-7 (pp. 73-74)

[8] Richard Mabey, *Food for Free*, Collins, October 2001.

[9] "FirstVoices- Ktunaxa. Plants: food plants: words." . Retrieved 2012-07-07.

[10] Harry Fong & Jerry Bauman 2002. Alternative Medicines for Cardiovascular Diseases--Hawthorn, *Journal of Cardiovascular Nursing* 16(4):1-8.

[11] Dharmananda S. (2004). "Hawthorn (*Crataegus*). Food and Medicine in China" . January. Institute of Traditional Medicine Online.

[12] "FirstVoices- Ktunaxa. Plants: medicine plants: words." . Retrieved 2012-07-11.

[13] "Hawthorn" (PDF). American College of Healthcare Sciences. Retrieved October 17, 2013.

[14] Ed Greenwood 1995, Electronic version of A Modern Herbal: The Medicinal, Culinary, Cosmetic and Economic Properties, Cultivation and Folk-Lore of Herbs, Grasses, Fungi, Shrubs & Trees with their Modern Scientific Uses, by Mrs. M. Grieve, first published 1931.

[15] Pittler MH, Guo R, Ernst E (2008). Guo, Ruoling, ed. "Cochrane Database of Systematic Reviews" . *Cochrane Database Syst Rev*. Jan 23 (1): CD005312. doi:10.1002/14651858.CD005312.pub2. PMID 18254076. |chapter= ignored (help)

[16] Tassell, M.; Kingston, R.; Gilroy, D.; Lehane, M.; Furey, A. (2010). Hawthorn (Crataegus spp.) in the treatment of cardiovascular disease. *Pharmacognosy Review*. 4(7): 32-41.

[17] Aaronson K: HERB-CHF: Hawthorn Extract Randomized Blinded Chronic Heart Failure Trial. In, 2004

[18] Sweet JMRBV (2002). Hawthorn: Pharmacology and therapeutic uses. *American Journal of Health-System Pharmacy* 59: 417-422

[19] Sloan-Kettering - Hawthorn

[20] Dasgupta A, Kidd L, Poindexter BJ, Bick RJ. Interference of hawthorn on serum digoxin measurements by immunoassays and pharmacodynamic interaction with digoxin. Arch Pathol Lab Med. 2010 Aug;134(8):1188-92.

[21] Tankenow, Roberta; Tamer, Helen R.; Streetman, Daniel S.; Smith, Scott G.; Welton, Janice L.; Annesley, Thomas; Aaronson, Keith D.; Bleske, Barry E. Interaction Study between Digoxin and a Preparation of Hawthorn (*Crataegus oxyacantha*), J Clin Pharmacol 2003;43:637-642

[22] Williamson, Tom (2013), *An Environmental History of Wildlife in England 1650 - 1950* Bloomsbury Academic, ISBN 978-1-4411-0863-0 (p. 104)

[23] "Hawthorn (Crataegus monogyna) progression" . Bonsai Empire. 2014. Retrieved 2 October 2014.

[24] "Scuil Wab: Wird O The Month - Mey" . Scottish Language Dictionaries. 2003. Archived from the original on 2008-06-04. Retrieved 2008-05-28.

[25] "Ne'er cast a clout till May be out" . The Phrase Finder. Retrieved 2008-05-28.

[26] "Hawthorn" . *Encyclopedia Britannica, 11th edition*. 1911. pp. 101–102.

[27] Campbell, John Gregorson (1900, 1902, 2005) *The Gaelic Otherworld*. Edited by Ronald Black. Edinburgh, Birlinn Ltd. ISBN 1-84158-207-7 p.345

[28] Danaher, Kevin (1972) *The Year in Ireland: Irish Calendar Customs* Dublin, Mercier. ISBN 1-85635-093-2 pp.86-127

[29] Monaghan, Patricia (2004-03-11). *The Red-Haired Girl from the Bog: The Landscape of Celtic Myth and Spirit*. New World Library. p. 67. ISBN 978-1-57731-458-5.

[30] Healy, Elizabeth (2002) *In Search of Ireland's Holy Wells*. Dublin, Wolfhound Press ISBN 0-86327-865-5 pp.56-7, 69, 81

[31] Palmer, Martin and Palmer, Nigel (*The Spiritual Traveler: England, Scotland, Wales : the Guide to Sacred Sites and Pilgrim Routes in Britain*, Hidden Spring, ISBN 1-58768-002-5 (p. 200)

[32] Bailey, L.H.; Bailey, E.Z.; the staff of the Liberty Hyde Bailey Hortorium. 1976. *Hortus third: A concise dictionary of plants cultivated in the United States and Canada*. Macmillan, New York.

[33] Bujarska-Borkowska, B. (2002) Breaking of seed dormancy, germination and seedling emergence of the common hawthorn (*Crataegus monogyna* Jacq.). *Dendrobiology*. 47(Supplement): 61–70.

[34] Palmer, E.J. (1925). Synopsis of North American *Crataegi*. *Journal of the Arnold Arboretum*. 6(1-2): 5–128.

[35] Phipps, J.B.; Robertson, K.R.; Smith, P.G.; Rohrer, J.R. (1990). A checklist of the subfamily Maloideae (Rosaceae). *Canadian Journal of Botany*. 68(10): 2209–2269.

[36] 50states.com missouri state flower

22.9 External links

- Crataegus Species - The Hawthorns at Plants For A Future

Chapter 23

Crataegus monogyna

Crataegus monogyna, known as **common hawthorn** or **single-seeded hawthorn**, is a species of hawthorn native to Europe, northwest Africa and western Asia. It has been introduced in many other parts of the world where it can be an invasive weed.

Other common names include **may**, **mayblossom**, **maythorn**, **quickthorn**, **whitethorn**, **motherdie**, and **haw**. This species is one of several that have been referred to as *Crataegus oxyacantha*, a name that has been rejected by the botanical community as too ambiguous.

23.1 Description

The Common Hawthorn is a shrub or small tree 5–14 m tall, with a dense crown. The bark is dull brown with vertical orange cracks. The younger stems bear sharp thorns, 1 to 1.5 cm long. The leaves are 2–4 cm long, obovate and deeply lobed, sometimes almost to the midrib, with the lobes spreading at a wide angle. The upper surface is dark green above and paler underneath.

The hermaphrodite flowers are produced in late spring (May to early June in its native area) in corymbs of 5-25 together; each flower is about 1 cm diameter, and has five white petals, numerous red stamens, and a single style; they are moderately fragrant. The flowers are pollinated by midges, bees and other insects and later in the year bear numerous *haws*. The haw is a small, oval dark red fruit about 1 cm long, berry-like, but structurally a pome containing a single seed. Haws are important for wildlife in winter, particularly thrushes and waxwings; these birds eat the haws and disperse the seeds in their droppings.

The Common Hawthorn is distinguished from the related but less widespread Midland Hawthorn (*C. laevigata*) by its more upright growth, the leaves being deeply lobed, with spreading lobes, and in the flowers having just one style, not two or three. However they are inter-fertile and hybrids occur frequently; they are only entirely distinct in their more typical forms.

- Common Hawthorn flowers
- Common Hawthorn thorns, leaves, and stipules
- Common Hawthorn fruit
- Close-up

23.2 Uses

23.2.1 Medicinal use

Crataegus monogyna is one of the most common species used as the "hawthorn" of traditional herbalism, which is of considerable interest for treating cardiac insufficiency by evidence-based medicine. The plant parts used medicinally

are usually sprigs with both leaves and flowers, or alternatively the fruit. Several species of *Crataegus* have both traditional and modern medicinal uses. It is a good source of antioxidant phytochemicals, especially extracts of hawthorn leaves with flowers.*[2]

Crataegus monogyna *'Crimson Cloud' in Elko Nevada*

23.2.2 In gardening and agriculture

Common Hawthorn is extensively planted as a hedge plant, especially for agricultural use. Its spines and close branching habit render it effectively stock- and human-proof, with some basic maintenance. The traditional practice of hedge laying is most commonly practised with this species. It is a good fire wood which burns with a good heat and little smoke.*[3]

Numerous hybrids exist, some of which are used as garden shrubs. The most widely used hybrid is *C.* × *media* (*C. monogyna* × *C. laevigata*), of which several cultivars are known, including the very popular 'Paul's Scarlet' with dark pink double flowers. Other garden shrubs that have sometimes been suggested as possible hybrids involving the Common Hawthorn, include the Various-leaved Hawthorn of the Caucasus, which is only very occasionally found in parks and gardens.

23.2.3 Edible "berries", petals, and leaves

The fruit of hawthorn, called haws, are edible raw but are commonly made into jellies, jams, and syrups, used to make wine, or to add flavour to brandy. Botanically they are pomes, but they look similar to berries. A haw is small and oblong, similar in size and shape to a small olive or grape, and red when ripe. Haws develop in groups of 2-3 along smaller branches. They are pulpy and delicate in taste. In this species (*C. monogyna*) they have only one seed, but in other species of hawthorn there may be up to 5 seeds.

Petals are also edible,*[4] as are the leaves, which if picked in spring when still young are tender enough to be used in salads.*[5]

23.3 Notable trees

An ancient specimen, and reputedly the oldest tree of any species in France, is to be found alongside the church at Saint Mars sur la Futaie, Mayenne.*[6] The tree has a height of 9 m, and a girth of 2.65 m (2009). The inscription on the plaque beneath reads: "This hawthorn is probably the oldest tree in France. Its origin goes back to St Julien (3rd century)", but such claims are impossible to verify.

A famous specimen in England was the Glastonbury or Holy Thorn which, according to legend, sprouted from the staff of Joseph of Arimathea after he thrust it into the ground while visiting Glastonbury in the 1st century AD. The tree was noteworthy because it flowered twice in a year, once in the late spring which is normal, but also once after the harshness of midwinter had passed. The original tree at Glastonbury Abbey, felled in the 1640s during the English Civil War,*[7] has been propagated as the cultivar 'Biflora'.*[8] A replacement was planted by the local council in 1951, but was cut down by vandals in 2010.*[9]

The oldest known living specimen in East Anglia, and possibly in the United Kingdom, is known as The Hethel Old Thorn,*[10] and is located in the churchyard in the small village of Hethel, south of Norwich, in Norfolk. It is reputed to be more than 700 years old, having been planted in the 13th century.*[10]

23.4 Gallery

- Bole of ancient hawthorn at Saint-Mars-sur-la-Futaie, France
- General view of the Saint-Mars tree
- Replacement of the Glastonbury or Holy Thorn cut down by vandals in 2010
- The Hethel Old Thorn, Hethel
- *Crataegus monogyna* in Joncret, Belgium

23.5 See also

- The hawthorn button-top gall on Hawthorn, is caused by the dipteron gall-midge *Dasineura crataegi*.

- Haweater
- List of Lepidoptera that feed on hawthorns
- Folklore about hawthorns, primarily the European species *C. laevigata* and/or *C. monogyna* and hybrids between these two species.

23.6 Notes

[1] Christensen, K.I. (1992). Revision of *Crataegus* sect. *Crataegus* and nothosect. *Crataeguineae* (Rosaceae-Maloideae) in the Old World. *Systematic Botany Monographs*. 35: 1–199.

[2] Oztürk N, Tunçel M.,"Assessment of Phenolic Acid Content and In Vitro Antiradical Characteristics of Hawthorn." *J Med Food*. 2011 May 9

[3] "The burning properties of wood" (PDF). Scouts.

[4] "Crataegus monogyna". *Survival and Self Sufficiency*. Retrieved 9 September 2011.

[5] Richard Mabey, *Food for Free*, Collins, October 2001.

[6] "Fiche AFFO: L'Aubépine monogyne". Pagesperso-orange.fr. Retrieved 2014-03-15.

[7] "BBC News - The mystery over who attacked the Holy Thorn Tree". Bbc.co.uk. 2012-04-04. Retrieved 2014-03-15.

[8] Phipps, J.B.; O'Kennon, R.J.; Lance, R.W. 2003. *Hawthorns and medlars*. Royal Horticultural Society, Cambridge, U.K.

[9] "BBC News - The mystery over who attacked the Holy Thorn Tree". Bbc.co.uk. 2012-04-04. Retrieved 2014-03-15.

[10] "Hethel Old Thorn". Wildlifetrusts.org/. Retrieved 18 February 2007.

23.7 References

- Philips, R. (1979). *Trees of North America and Europe*, Random House, Inc., New York. ISBN 0-394-50259-0.

23.8 Further reading

- Bahorun, Theeshan, et al. (2003). Phenolic constituents and antioxidant capacities of Crataegus monogyna (Hawthorn) callus extracts. *Food/Nahrung* 47.3 (2003): 191–198.

23.9 External links

- *Crataegus monogyna* in Topwalks
- Hawthorn Gallery (photographs of a number of such trees, including Hethel Old Thorn)
- "Hawthorn". *Encyclopedia Americana*. 1920.

Chapter 24

Crataegus laevigata

Crataegus laevigata, known as the **midland hawthorn**,[*][2] **English hawthorn**,[*][2] **woodland hawthorn**[*][2] or **mayflower**, is a species of hawthorn native to western and central Europe, from Great Britain (where it is uncommon, and largely confined to the Midlands) and Spain east to the Czech Republic and Hungary. It's also present in North Africa. The species name is sometimes spelled *C. levigata*,[*][3] but the original orthography is *C. lævigata*.[*][4][*][5]

It is a large shrub or small tree growing to 8 m (rarely to 12 m) tall, with a dense crown. The leaves are 2–6 cm long and 2–5 cm broad, with 2–3 shallow, forward-pointing lobes on each side of the leaf. The hermaphrodite flowers are produced in corymbs of 6–12, each flower with five white or pale pink petals and two or three styles, and are pollinated by midges. The fruit is a dark red pome 6–10 mm diameter, slightly broader than long, containing 2–3 nutlets.

Crataegus laevigata *(fruits)*

It is distinguished from the related common hawthorn, *C. monogyna*, in the leaves being only shallowly lobed, with forward-pointing lobes, and in the flowers having more than one style. However hybrids occur frequently.

24.1 Taxonomy

In the past, midland hawthorn was widely but incorrectly known by the name *C. oxyacantha*, a name that has now been rejected as being of uncertain application. In 1753 Linnaeus introduced the name *C. oxyacantha* for the single species of which he was aware, but described it in such a way that the name became used for various species, including both the midland and the common hawthorn. In 1775 Jacquin formally separated the common hawthorn, naming it *C. monogyna*,*[6] and in 1946 Dandy showed that Linnaeus had actually observed a different plant, and this would be *C. oxyacantha*. However, by this time confusion over the true identity of *C. oxyacantha* was so great that Byatt proposed*[7] that the name should be formally rejected as ambiguous, and this proposal was accepted by the International Botanical Congress,*[8] although the name continues to be used informally.

The midland hawthorn was described botanically as a separate species as long ago as 1798 by Poiret, whose name *Mespilus laevigata* referred to this hawthorn. Poiret's name is reflected in the revised formal botanical name of midland hawthorn: *Crataegus laevigata* (Poir.) DC.

24.2 Cultivars

'François Rigaud' has yellow fruit.*[9]

'Paul's Scarlet'*[10] (double red flowers) and 'Rosea Flore Pleno'*[11] (double pink flowers) have both gained the Royal Horticultural Society's Award of Garden Merit. These cultivars are considered by taxonomists to be derived from hybrids between *C. laevigata* and *C. monogyna*, within the named hybrid species *C. × media*.*[9]

24.3 See also

- The hawthorn button-top gall on midland hawthorn, is caused by the dipteran gall-midge *Dasineura crataegi*.

24.4 References

[1] Christensen, K.I. (1992). Revision of *Crataegus* sect. *Crataegus* and nothosect. *Crataeguineae* (Rosaceae-Maloideae) in the Old World. *Systematic Botany Monographs*. 35: 1–199.

[2] "USDA GRIN taxonomy".

[3] Gutermann, W. (2011). "Notulae nomenclaturales 41-45. (New names in *Cruciata*, *Kali*, and some small corrections)". *Phyton - Annales Rei Botanicae* **51** (1): 95–102.

[4] Poiret, J.L.M. (1798). "Néflier; Mespilus". In J.B.A.P.d.M. De Lamarck. *Encyclopédie Méthodique. Botanique* **4**. Paris: H. Agasse. pp. 437–447.

[5] Christensen, K.I.; Talent, N. (2013). "*Crataegus laevigata* or *C. levigata* – a Paleographic Analysis". *Phyton: Annales Rei Botanicae* **52** (2): 195–201.

[6] Jacquin, N.J. 1775. Florae Austriacae sive Plantarum Selectarum in Austriæ archiducatu: sponte crescentium icones, ad vivum coloratæ, et descriptionibus, ac synonymis illustratæ.

[7] Byatt, J. (1974). *Bot. J. Linn. Soc.* 69: 15–20.

[8] Brummitt, R. K. (1986). *Taxon* 35: 556–563.

[9] Phipps, J.B.; O'Kennon, R.J.; Lance, R.W. 2003. *Hawthorns and medlars*. Royal Horticultural Society, Cambridge, U.K.

[10] "RHS Plant Selector - *Crataegus laevigata 'Paul's Scarlet'*". Retrieved 20 July 2013.

[11] "RHS Plant Selector - *Crataegus laevigata* 'Rosea Flore Pleno'". Retrieved 20 July 2013.

- Flora Europaea: *Crataegus*
- Bean, W. J. (1976). *Trees and Shrubs Hardy in the British Isles*, eighth edition, revised. John Murray.
- UCConn Plant Database —*copyright Mark Brand*.

24.5 Further Reading

Koch, Egon; Malek, Fathi Abdul; Schwabe, Willmar (July 2011). "Standardized Extracts from Hawthorn Leaves and Flowers in the Treatment of Cardiovascular Disorders - Preclinical and Clinical Studies" . *Planta Medica* **77** (11): 1123=1128. doi:10.1055/s-0030-1270849.

24.6 External links

Chapter 25

Crataegus × media

Crataegus* × *media, is a hybrid between two species in the genus *Crataegus* (Hawthorn), *C. monogyna* and *C. laevigata*, both in series *Crataegus*. Under the rules of botanical nomenclature the name *C.* × *media* covers all intermediate forms between the two parent species, including backcrosses.

Horticulturally significant forms of *C.* × *media* include some with double pink or red flowers, including 'Paul's scarlet' and 'Rubra Plena'.*[2]

25.1 References and external links

[1] Christensen, K.I. (1992). Revision of *Crataegus* sect. *Crataegus* and nothosect. *Crataeguineae* (Rosaceae-Maloideae) in the Old World. *Systematic Botany Monographs*. 35: 1–199.

[2] Phipps, J.B., O' Kennon, R.J., Lance, R.W. (2003). *Hawthorns and medlars*. Royal Horticultural Society, Cambridge, U.K.

Chapter 26

Hazel

For other uses, see Hazel (disambiguation).

The **hazel** (*Corylus*) is a genus of deciduous trees and large shrubs native to the temperate Northern Hemisphere. The genus is usually placed in the birch family Betulaceae,[*][2][*][3][*][4][*][5] though some botanists split the hazels (with the hornbeams and allied genera) into a separate family Corylaceae.[*][6][*][7] The fruit of the hazel is the hazelnut.

Hazels have simple, rounded leaves with double-serrate margins. The flowers are produced very early in spring before the leaves, and are monoecious, with single-sex catkins, the male catkins are pale yellow and 5–12 cm long, and the female ones are very small and largely concealed in the buds, with only the bright-red, 1-to-3 mm-long styles visible. The fruits are nuts 1–2.5 cm long and 1–2 cm diameter, surrounded by an involucre (husk) which partly to fully encloses the nut.[*][4]

The shape and structure of the involucre, and also the growth habit (whether a tree or a suckering shrub), are important in the identification of the different species of hazel.[*][4]

The pollen of hazel species, which are often the cause for allergies in late winter or early spring, can be identified under magnification (600X) by their characteristic granular exines bearing three conspicuous pores.[*][8]

26.1 Species

Corylus has 14–18 species. The circumscription of species in eastern Asia is disputed, with *WCSP* and the *Flora of China* differing in which taxa are accepted; within this region, only those taxa accepted by both sources are listed below.[*][4][*][9][*][10][*][11] The species are grouped as follows:

- Nut surrounded by a soft, leafy involucre, multiple-stemmed, suckering shrubs to 12 m tall
  - Involucre short, about the same length as the nut
    - *Corylus americana*—American hazel, eastern North America
    - *Corylus avellana*—Common hazel, Europe and western Asia
    - *Corylus heterophylla*—Asian hazel, Asia
    - *Corylus yunnanensis*—Yunnan hazel, central and southern China
  - Involucre long, twice the length of the nut or more, forming a 'beak'
    - *Corylus colchica*—Colchican filbert, Caucasus
    - *Corylus cornuta*—Beaked hazel, North America
    - *Corylus maxima*—Filbert, southeastern Europe and southwest Asia
    - *Corylus sieboldiana*—Asian beaked hazel, northeastern Asia and Japan (syn. *C. mandshurica*)
- Nut surrounded by a stiff, spiny involucre, single-stemmed trees to 20–35 m tall
  - Involucre moderately spiny and also with glandular hairs
    - *Corylus chinensis*—Chinese hazel, western China

- *Corylus colurna*—Turkish hazel, southeastern Europe and Asia Minor
- *Corylus fargesii*—Farges' hazel, western China
- *Corylus jacquemontii*—Jacquemont's hazel, Himalaya
- *Corylus wangii*—Wang's hazel, southwest China

- Involucre densely spiny, resembling a chestnut burr
  - *Corylus ferox*—Himalayan hazel, Himalaya, Tibet and southwest China (syn. *C. tibetica*).

Several hybrids exist, and can occur between species in different sections of the genus, e.g. *Corylus* × *colurnoides* (*C. avellana* × *C. colurna*). The oldest confirmed hazel species is *Corylus johnsonii* found as fossils in the Ypresian-age rocks of Ferry County, Washington.*[12]

26.2 Uses

The nuts of all hazels are edible. The common hazel is the species most extensively grown for its nuts, followed in importance by the filbert. Nuts are also harvested from the other species, but apart from the filbert, none is of significant commercial importance.*[5]

A number of cultivars of the common hazel and filbert are grown as ornamental plants in gardens, including forms with contorted stems (*C. avellana* 'Contorta', popularly known as "Harry Lauder's walking stick" from its gnarled appearance); with weeping branches (*C. avellana* 'Pendula'); and with purple leaves (*C. maxima* 'Purpurea').

Hazel is a traditional material used for making wattle, withy fencing, baskets, and the frames of coracle boats. The tree can be coppiced, and regenerating shoots allow for harvests every few years.

Hazels are used as food plants by the larvae of various species of Lepidoptera.

26.2.1 Mythology and folklore

The Celts believed hazelnuts gave one wisdom and inspiration. There are numerous variations on an ancient tale that nine hazel trees grew around a sacred pool, dropping into the water nuts that were eaten by salmon (a fish sacred to Druids), which absorbed the wisdom. A Druid teacher, in his bid to become omniscient, caught one of these special salmon and asked a student to cook the fish, but not to eat it. While he was cooking it, a blister formed and the pupil used his thumb to burst it, which he naturally sucked to cool, thereby absorbing the fish's wisdom. This boy was called Fionn Mac Cumhail (Fin McCool) and went on to become one of the most heroic leaders in Gaelic mythology.*[13]

"The Hazel Branch" from *Grimms' Fairy Tales* claims that hazel branches offer the greatest protection from snakes and other things that creep on the earth.

26.3 Gallery

- Form (Farges' hazel)
- Male catkins (common hazel)
- Leaves and nuts with spiny husks (Turkish hazel)
- Female flower (common hazel)
- Hazelnuts

Giresun Hazel Turkey

26.4 References

[1] Kew World Checklist of Selected Plant Families

[2] Germplasm Resources Information Network: *Corylus*

[3] Chen, Z.-D. et al. (1999). Phylogeny and evolution of the Betulaceae as inferred from DNA sequences, morphology, and paleobotany. *Amer. J. Bot.* 86: 1168–1181. Available online.

[4] Rushforth, K. (1999). *Trees of Britain and Europe*. Collins ISBN 0-00-220013-9.

[5] Huxley, A., ed. (1992). *New RHS Dictionary of Gardening*. Macmillan ISBN 0-333-47494-5.

[6] Bean, W. J. (1976). *Trees and Shrubs Hardy in the British Isles* 8th ed., vol. 1. John Murray ISBN 0-7195-1790-7.

[7] Erdogan, V. & Mehlenbacher, S. A. (2002). Phylogenetic analysis of hazelnut species (Corylus, Corylacae) based on morphology and phenology. *Sist. Bot. Dergisi* 9: 83–100.

[8] Nature 10, 355-355 (03 September 1874) | doi:10.1038/010355b0 (Letters to the Editor). Retrieved 23 February 2014.

[9] WCSP: *Corylus*

[10] Flora of China: *Corylus*

[11] Flora of North America: *Corylus*

[12] Pigg, K.B.; Manchester S.R.; Wehr W.C. (2003). "*Corylus*, *Carpinus*, and *Palaeocarpinus* (Betulaceae) from the Middle Eocene Klondike Mountain and Allenby Formations of Northwestern North America". *International Journal of Plant Sciences* **164** (5): 807–822. doi:10.1086/376816.

[13] Floriz: Mythology and Folklore of the Hazel Tree

26.5 External links

- Eichhorn, Markus (December 2010). "The Hazel Tree". *Test Tube*. Brady Haran for the University of Nottingham.

Chapter 27

Corylus avellana

The Common Hazel in the forest near Kyiv in winter.

Corylus avellana, the **common hazel**, is a species of hazel native to Europe and western Asia, from the British Isles south to Iberia, Greece, Turkey and Cyprus, north to central Scandinavia, and east to the central Ural Mountains, the Caucasus, and northwestern Iran.*[2]*[3]*[4] It is an important component of the hedgerows that were the traditional field boundaries in lowland England. The wood was traditionally grown as coppice, the poles cut being used for wattle-and-daub building and agricultural fencing.

Common hazel is cultivated for its nuts. The name hazelnut applies to the nuts of any of the species of the genus *Corylus*. This hazelnut or **cob nut**, the kernel of the seed, is edible and used raw or roasted, or ground into a paste. The cob is round, compared with the longer filbert nut.

27.1 Description

Common hazel is typically a shrub reaching 3–8 m tall, but can reach 15 m. The leaves are deciduous, rounded, 6–12 cm long and across, softly hairy on both surfaces, and with a double-serrate margin. The flowers are produced very early in spring, before the leaves, and are monoecious with single-sex wind-pollinated catkins. Male catkins are pale yellow and 5–12 cm long, while female catkins are very small and largely concealed in the buds with only the bright red 1–3 mm long styles visible. The fruit is a nut, produced in clusters of one to five together, each nut held in a short leafy involucre ("husk") which encloses about three quarters of the nut. The nut is roughly spherical to oval, 15–20 mm long and 12–20 mm broad (larger, up to 25 mm long, in some cultivated selections), yellow-brown with a pale scar at the base. The nut falls out of the involucre when ripe, about 7–8 months after pollination.*[2]*[4]*[5]

It is readily distinguished from the closely related filbert (*Corylus maxima*) by the short involucre; in the filbert the nut is fully enclosed by a beak-like involucre longer than the nut.*[2]

27.2 Taxonomy

The scientific name *avellana* derives from the town of Avella in Italy,*[6] and was selected by Linnaeus from Leonhart Fuchs's *De historia stirpium commentarii insignes* (1542), where the species was described as "*Avellana nux sylvestris*" ("wild nut of Avella").*[7]

27.3 Ecology

The leaves provide food for many animals, including Lepidoptera such as the case-bearer moth, *Coleophora anatipennella*. Caterpillars of the concealer moth, *Alabonia geoffrella,* have been found feeding inside dead common hazel twigs. See also *List of Lepidoptera that feed on hazels.*

The fruit are possibly even more important animal food, both for invertebrates adapted to circumvent the shell (usually by ovipositing in the female flowers, which also gives protection to the offspring) and for vertebrates which manage to crack them open (such as squirrels and corvids).

27.4 Cultivation and uses

The common hazel is a shrub common in many European woodlands. It is an important component of the hedgerows that were the traditional field boundaries in lowland England. The wood was traditionally grown as coppice, the poles cut being used for wattle-and-daub building and agricultural fencing.*[2] A selection with twisted branches has been propagated horticulturally as *Corylus avellana* 'Contorta'.

27.5 Hazelnuts

Main article: Hazelnut

The hazelnut, also known as the cobnut, is the nut of the hazel. It is roughly spherical to oval in shape, about 15–25 mm long and 10–15 mm in diameter, with an outer fibrous husk surrounding a smooth shell. The nut falls out of the husk when ripe, about seven to eight months after pollination.

Hazelnuts are rich in protein and unsaturated fat. Moreover, they contain significant amounts of manganese, copper, vitamin E, thiamine, and magnesium.*[8]

There are many cultivars of the hazel, including Barcelona, Butler, Casina, Clark Cosford, Daviana, Delle Langhe, England, Ennis, Fillbert, Halls Giant, Jemtegaard, Kent Cob, Lewis, Tokolyi, Tonda Gentile, Tonda di Giffoni, Tonda Romana, Wanliss Pride, and Willamette.*[9] Some of these are grown for specific qualities of the nut including large nut size, and early and late fruiting cultivars, whereas other are grown as pollinators. The majority of commercial hazelnuts are propagated from root sprouts.*[9] Some cultivars are of hybrid origin between common hazel and filbert.*[5]

Common hazel is cultivated for its nuts in commercial orchards in Europe, Turkey, Iran and Caucasus. The name "hazelnut" applies to the nuts of any of the species of the genus *Corylus*. This hazelnut or cobnut, the kernel of the seed, is edible and used raw or roasted, or ground into a paste. The seed has a thin, dark brown skin which has a bitter flavour and is sometimes removed before cooking. The top producer of hazelnuts, by a large margin, is Turkey, specifically the Ordu Province. Turkish hazelnut production of 625,000 tonnes accounts for approximately 75% of worldwide production.*[10]

27.6 References

[1] Fitter, R. and Fitter A., The Wild Flowers of Britain and Northern Europe (1978) 3rd Eds. William Collins & Sons Ltd, Glasgow

[2] Rushforth, K. (1999). *Trees of Britain and Europe*. Collins ISBN 0-00-220013-9.

[3] Den Virtuella Floran: map

[4] Trees for Life Hazel species profile

[5] Flora of NW Europe: *Corylus avellana*

[6] Mitchell, A. F. (1982). *The Trees of Britain and Northern Europe*. Collins ISBN 0-00-219037-0

[7] Linnaeus, C. (1753). *Species Plantarum* p. 998.

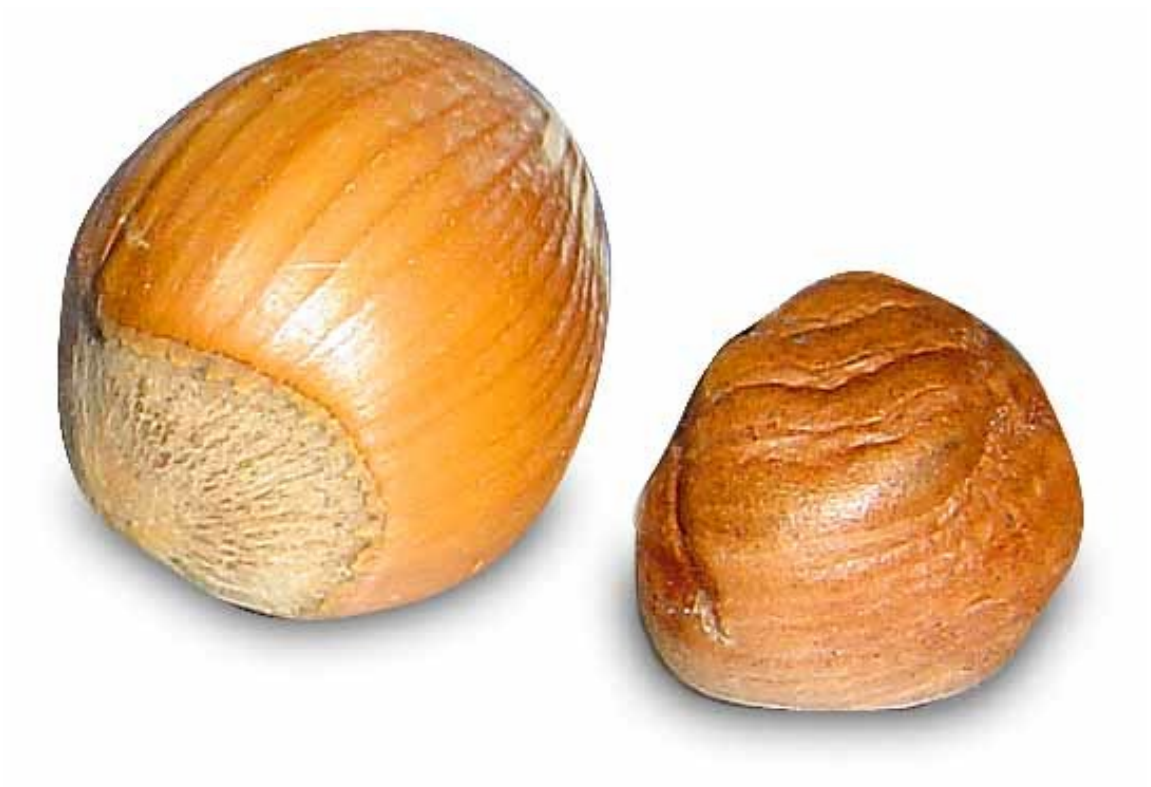
[8] *SELF* Nutrition data, Nuts, hazelnuts or filberts. Accessed 2014-08-22.

[9] Huxley, A., ed. (1992). *New RHS Dictionary of Gardening*. Macmillan. ISBN 0-333-47494-5.

[10] *World Hazelnut Situation and Outlook*, USDA 2004.

27.7 External links

Corylus avellana 'Contorta'



Hazelnuts, with shell (left), without shell (right)

Chapter 28

Hornbeam

Hornbeams are relatively small hardwood trees in the genus *Carpinus*. Though some botanists grouped them with the hazels (*Corylus*) and hop-hornbeams (*Ostrya*) in a segregated family, *Corylaceae*, modern botanists place the hornbeams in the birch subfamily Coryloideae. The 30–40 species occur across much of the north temperate regions, with the greatest number of species in east Asia, particularly China. Only two species occur in Europe, only one in eastern North America, and one in Mesoamerica.[*][1][*][2][*][3][*][4][*][5]

28.1 Origin of names

The common English name "hornbeam" derives from the hardness of the woods (likened to horn) and the Old English "beam", a tree (cognate with German "*Baum*"). The American hornbeam is also occasionally known as blue-beech, ironwood, or musclewood, the first from the resemblance of the bark to that of the American beech *Fagus grandifolia*, the other two from the hardness of the wood and the muscular appearance of the trunk, respectively. The botanic name for the genus, *Carpinus*, is the original Latin name for the European species.

28.2 Identification

The leaves are deciduous, alternate, and simple with a serrated margin, and typically vary from 3–10 cm in length. The flowers are wind-pollinated pendulous catkins, produced in spring. The male and female flowers are on separate catkins, but on the same tree (monoecious). The fruit is a small nut about 3–6 mm long, held in a leafy bract; the bract may be either trilobed or simple oval, and is slightly asymmetrical. The asymmetry of the seedwing makes it spin as it falls, improving wind dispersal. The shape of the wing is important in the identification of different hornbeam species. Typically, 10–30 seeds are on each seed catkin.

28.3 Associated insects

Hornbeams are used as food plants by the larvae of some Lepidoptera species, including autumnal moth, common emerald, feathered thorn, walnut sphinx, Svensson's copper underwing, and winter moth (recorded on European Hornbeam) as well as the *Coleophora* case-bearers *C. currucipennella* and *C. ostryae*.[*][6]

28.4 Applications

Hornbeams yield a very hard timber, giving rise to the name "ironwood".[*][7] Dried heartwood billets are nearly white and are suitable for decorative use. For general carpentry, hornbeam is rarely used, partly due to the difficulty of working it. Its hardness has, however, lent it to use for carving boards, tool handles, handplane soles, coach wheels, piano actions, shoe lasts, and other uses where a very tough, hard wood is required. Perhaps most interestingly as gear

Hornbeam trunk

pegs in simple machines, including traditional windmills.[*][7] It is sometimes coppiced to provide hardwood poles. It is also used in parquet flooring and for making chess pieces.

Hornbeam has been listed as one of the 38 substances used to prepare Bach flower remedies,[*][8] a kind of alternative medicine promoted for its effect on health. However, according to Cancer Research UK, "there is no scientific evidence to prove that flower remedies can control, cure or prevent any type of disease, including cancer".[*][9]

28.5 Species

Accepted species*[1]

1. *Carpinus betulus* L. —European hornbeam - widespread across much of Europe; Turkey, Iran, Caucasus; naturalized in a few places in US
2. *Carpinus caroliniana* Walter —American hornbeam - Quebec, Ontario, eastern half of US
3. *Carpinus chuniana* Hu - Guangdong, Guizhou, Hubei
4. *Carpinus cordata* Blume —Sawa hornbeam - Primorye, China, Korea, Japan
5. *Carpinus dayongiana* K.W.Liu & Q.Z.Lin - Hunan
6. *Carpinus eximia* Nakai - Korea
7. *Carpinus faginea* Lindl. - Nepal, Himalayas of northern India
8. *Carpinus fangiana* Hu*[10] - Sichuan, Guangxi
9. *Carpinus hebestroma* Yamam. - Taiwan
10. *Carpinus henryana* (H.J.P.Winkl.) H.J.P.Winkl. - southern China
11. *Carpinus japonica* Blume —Japanese hornbeam - Japan
12. *Carpinus kawakamii* Hayata - Taiwan, southeastern China
13. *Carpinus kweichowensis* Hu - Guizhou, Yunnan
14. *Carpinus laxiflora* (Siebold & Zucc.) Blume —Aka-shide hornbeam - Japan, Korea
15. *Carpinus lipoensis* Y.K.Li - Guizhou
16. *Carpinus londoniana* H.J.P.Winkl. - southern China, northern Indochina
17. *Carpinus luochengensis* J.Y.Liang - Guangxi
18. *Carpinus mengshanensis* S.B.Liang & F.Z.Zhao - Shandong
19. *Carpinus microphylla* Z.C.Chen ex Y.S.Wang & J.P.Huang - Guangxi
20. *Carpinus mollicoma* Hu - Tibet, Sichuan, Yunnan
21. *Carpinus monbeigiana* Hand.-Mazz. - Tibet, Yunnan
22. *Carpinus omeiensis* Hu & W.P.Fang - Sichuan, Guizhou
23. *Carpinus orientalis* Mill. —Oriental hornbeam - Hungary, Balkans, Italy, Crimea, Turkey, Iran, Caucasus
24. *Carpinus paohsingensis* W.Y.Hsia - China
25. *Carpinus polyneura* Franch. - southern China
26. *Carpinus pubescens* Burkill - China, Vietnam
27. *Carpinus purpurinervis* Hu - Guizhou, Guangxi
28. *Carpinus putoensis* W.C.Cheng —Putuo hornbeam - Zhejiang
29. *Carpinus rankanensis* Hayata - Taiwan
30. *Carpinus rupestris* A.Camus - Yunnan, Guangxi, Guizhou
31. *Carpinus shensiensis* Hu - Gansu, Shaanxi
32. *Carpinus shimenensis* C.J.Qi - Hunan

33. †*Carpinus tengshongensis* W.C.Cheng*[11] - Zhejiang but probably extinct
34. *Carpinus tropicalis* (Donn.Sm.) Lundell - Mexico, Central America
35. *Carpinus tsaiana* Hu - Yunnan, Guizhou
36. *Carpinus tschonoskii* Maxim. —Chonowski's hornbeam - China, Korea, Japan
37. *Carpinus turczaninowii* Hance —Turkzaninov's hornbeam - China, Korea, Japan
38. *Carpinus viminea* Wall. ex Lindl. - China, Korea, Himalayas, northern Indochina

28.6 See also

- *Acer carpinifolium*, hornbeam maple

28.7 References

[1] Kew World Checklist of Selected Plant Families

[2] Flora of China, Vol. 4 Page 289, 鹅耳枥属 e er li shu, *Carpinus* Linnaeus, Sp. Pl. 2: 998. 1753.

[3] Flora of North America, Vol. 3, Hornbeam, *Carpinus* Linnaeus, Sp. Pl. 2: 998. 1753; Gen. Pl. ed. 5, 432, 1754.

[4] Altervista Flora Italiana

[5] Biota of North America Program, 2013 county distribution maps

[6] *Miscellaneous Publication*. U.S. Department of Agriculture. 1972. p. 297.

[7] Eichhorn, Marks; Haran, Brady (2011-12-01). "The Hornbeam's Heartbeat". *Test Tube*. University of Nottingham. Retrieved 2012-12-30.

[8] D. S. Vohra (1 June 2004). *Bach Flower Remedies: A Comprehensive Study*. B. Jain Publishers. p. 3. ISBN 978-81-7021-271-3. Retrieved 2 September 2013.

[9] "Flower remedies". Cancer Research UK. Retrieved September 2013.

[10] "Carpinus fangiana". Rogers Trees and Shrubs.

[11] Dai, Jing; Sun, Bainian; Xie, Sanping; Lin, Zhicheng; Wu, Jingyu; Dao, Kequn (2013). "A new species of *Carpinus* (Betulaceae) from the Pliocene of Yunnan Province, China". *Plant Systematics and Evolution* **299** (3): 643–658. doi:10.1007/s00606-012-0750-1.

28.8 External links

- Eichhorn, Markus (December 2011). "Hornbeam". *Test Tube*. Brady Haran for the University of Nottingham.

Chapter 29

Carpinus betulus

Carpinus betulus, commonly known as the **European** or **common hornbeam**, is a hornbeam native to Western Asia and central, eastern, and southern Europe, including southern England.* [1] It requires a warm climate for good growth, and occurs only at elevations up to 600 metres (1,969 ft). It grows in mixed stands with oak, and in some areas beech, and is also a common tree in scree forests.

29.1 Description

European Hornbeam seed catkins

It is a small to medium-size tree reaching heights of 15–25 metres (49–82 ft), rarely 30 m (98 ft), and often has a

fluted and crooked trunk. The bark is smooth and greenish-grey, even in old trees. The buds, unlike those of the beech, are 10 mm (0.39 in) long at the most, and pressed close to the twig. The leaves are alternate, 4–9 cm (1.6–3.5 in) long, with prominent veins giving a distinctive corrugated texture, and a serrated margin. It is monoecious, and the wind-pollinated male and female catkins appear in early summer after the leaves. The fruit is a small 7–8 mm (0.28–0.31 in) long nut, partially surrounded by a three-pointed leafy involucre 3–4 cm (1.2–1.6 in) long; it matures in autumn. The seeds often do not germinate till the spring of the second year after sowing. The hornbeam is a prolific seeder and is marked by vigorous natural regeneration.

Carpinus betulus is a shade-loving tree, which prefers moderate soil fertility and moisture. It has a shallow, wide-spreading root system and is marked by the production of stump sprouts when cut back. Because it stands up well to cutting back and has dense foliage, it has been much used in landscape gardening, mainly as tall hedges and for topiary. The wood is heavy and hard, and is used for tools and building constructions. It also burns hot and slowly, making it a very suitable firewood.*[2] This was the reason for lopping and hence indirectly the saving of Epping Forest, where the hornbeam was a favoured pollarding tree.

> *See also List of Lepidoptera that feed on Carpinus*

The leaves provide food for some animals, including Lepidoptera such as the case-bearer moth *Coleophora anatipennella*.

There are a number of notable forests where *C. betulus* is a dominant tree species, among which are:

- Epping Forest, Essex/London, UK
- Halltorp Nature Reserve, Öland, Sweden

29.2 Cultivation

Carpinus betulus is cultivated as an ornamental tree, for planting in gardens and parks. There are several cultivars, notably *C. betulus* 'Fastigiata' or 'Pyramidalis', a very fastigiate tree when young, which has become a popular urban street tree in the United Kingdom.

Both the species*[3] and the cultivar *C. betulus* 'Fastigiata'*[4] have gained the Royal Horticultural Society's Award of Garden Merit.

29.3 Gallery

-
- European Hornbeam in winter
- Veteran tree
- Hornbeamtree-covered walk (573m)
- Carpinus betulus - MHNT
- bud

29.4 References

[1] http://www.nhm.ac.uk/fff-pcp/glob.pl?report=pcfllist&group=&sort=&inpos=nr6

[2] http://www.gardeningcentral.org/hornbeam_tree/hornbeam_tree.html Tree Profile for Hornbeam

[3] "RHS Plant Selector - *Carpinus betulus*". Retrieved 25 June 2013.

[4] "RHS Plant Selector - *Carpinus betulus* 'Fastigiata'". Retrieved 25 June 2013.

29.5 External links

- Den virtuella floran: *Carpinus betulus* distribution

Chapter 30

Holly

"Ilex" redirects here. For other uses, see Holly (disambiguation) and Ilex (disambiguation).
Not to be confused with Holy.

Ilex /ˈaɪlɛks/, or **holly**,*[1] is a genus of 400 to 600 species of flowering plants in the family **Aquifoliaceae**, and the only living genus in that family. The species are evergreen and deciduous trees, shrubs, and climbers from tropics to temperate zones worldwide.

30.1 Description

*European Holly (*Ilex aquifolium*) leaves and fruit*

The genus *Ilex* is widespread throughout the temperate and subtropical regions of the world. It includes species

of trees, shrubs, and climbers, with evergreen or deciduous foliage and inconspicuous flowers. Its range was more extended in the Tertiary period and many species are adapted to laurel forest habitat. It occurs from sea level to more than 2,000 metres (6,600 ft) with high mountain species. It is a genus of small, evergreen trees with smooth, glabrous, or pubescent branchlets. The plants are generally slow-growing with some species growing to 25 m (82 ft) tall. The type species is the European holly *Ilex aquifolium* described by Linnaeus.*[2]

Plants in this genus have simple, alternate glossy leaves, typically with a spiny toothed, or serrated leaf margin. The inconspicuous flower is greenish white, with four petals. They are generally dioecious, with male and female flowers on different plants.

The small fruits of *Ilex*, although often referred to as berries, are technically drupes.*[3] They range in color from red to brown to black, and rarely green or yellow. The "bones" contain up to ten seeds each. Some species produce fruits parthenogenetically, such as the cultivar 'Nellie R. Stevens'. The fruits ripen in winter and thus provide winter colour contrast between the bright red of the fruits and the glossy green evergreen leaves. Hence the cut branches, especially of *I. aquifolium*, are widely used in Christmas decoration. The fruits are generally slightly toxic to humans, and can cause vomiting and diarrhea when ingested. However, they are an important food source for birds and other animals, which help disperse the seeds.

30.2 Etymology

Ilex in Latin means the holm-oak or evergreen oak (*Quercus ilex*). Despite the Linnaean classification of *Ilex* as holly, as late as the 19th century in Britain, the term *Ilex* was still being applied to the oak as well as the holly – possibly due to the superficial similarity of the leaves.*[4]*[5] The name "holly" in common speech refers to *Ilex aquifolium*, specifically stems with berries used in Christmas decoration. By extension, "holly" is also applied to the whole genus. The origin of the word "holly" is considered a reduced form of Old English *hole(ġ)n*,*[6] Middle English *Holin*, later *Hollen*.*[7] *[8] The French word for holly, *houx*, derives from the Old Low Franconian **hulis* (Middle Dutch *huls*).*[9] Both are related to Old High German *hulis*, *huls*,*[10] as are Low German/Low Franconian terms like *Hülse* or *hulst*. These Germanic words appear to be related to words for holly in Celtic languages, such as Welsh *celyn*, Breton *kelen(n)* and Irish *cuileann*. *[11]

Several romance languages use the Latin word *acrifolium* (turned into *aquifolium* in modern time), so Italian *agrifoglio*, Occitan *grefuèlh*, etc. *[12]

30.3 History

The phylogeography of this group provides examples of various speciation mechanisms at work. In this scenario ancestors of this group became isolated from the remaining *Ilex* when the Earth mass broke away into Gondwana and Laurasia about 82 million years ago, resulting in a physical separation of the groups and beginning a process of change to adapt to new conditions. This mechanism is called allopatric speciation. Over time survivor species of the holly genus adapted to different ecological niches. This led to reproductive isolation, an example of ecological speciation. In the Pliocene, around five million years ago, mountain formation diversified the landscape and provided new opportunities for speciation within the genus.

The fossil record indicates that the *Ilex* lineage was already widespread prior to the end of the Cretaceous period. Based on the molecular clock the common ancestor of most of the extant species probably appeared during the Eocene, about 50 million years ago, suggesting that older representatives of the genus belong to now extinct branches.*[13] The laurel forest covered great areas of the Earth during the Paleogene, when the genus was more prosperous. This type of forest extended during the Neogene, more than 20 million years ago. Most of the last remaining temperate evergreen forests are believed to have disappeared about 10,000 years ago at the end of the Pleistocene. Many of the then existing species with the strictest ecological requirements became extinct because they could not cross the barriers imposed by the geography, but others found refuge as a species relict in coastal enclaves, archipelagos, and coastal mountains sufficiently far from the extreme cold and aridity and protected by the oceanic influence.

The genus includes about 400 to 600 species, divided into three subgenera:

- *Ilex* subg. *Byronia*, with the type species *Ilex polypyrena*
- *Ilex* subg. *Prinos*, with 12 species

Hollies (here, Ilex aquifolium*) are dioecious: (above) shoot with flowers from male plant; (top right) male flower enlarged from female plant; (lower right) female flower enlarged, showing stamen and reduced, sterile stamens with no pollen.*

- *Ilex* subg. *Ilex*, with the rest of the over 400 species

30.4 Range

The genus is distributed throughout the world's different climates. Most species make their home in the tropics and subtropics, with a worldwide distribution in temperate zones. The greatest diversity of species is found in the Americas and in Southeast Asia.

Ilex mucronata, formerly the type species of *Nemopanthus*, is native to eastern North America.*[14] *Nemopanthus* was treated as a monotypic genus with eight species.*[15] of the family Aquifoliaceae, now transferred to *Ilex* on molecular data;*[16] it is closely related to *Ilex amelanchier*.*[17]

In Europe the genus is represented by a single species, the classically named holly *Ilex aquifolium*, and in continental Africa by this species and (*Ilex mitis*). *Ilex canariensis*, from Macaronesia, and *Ilex aquifolium* arose from a common ancestor in the laurel forests of the Mediterranean. Australia, isolated at an early period, has (*Ilex arnhemensis*). Of 204 species growing in China, 149 species are endemic. A species which stands out for its economic importance in Spanish-speaking countries is *Ilex paraguariensis* or *Yerba mate*. Having evolved numerous species that are endemic to islands and small mountain ranges, and being highly useful plants, many hollies are now becoming rare.

30.5 Ecology

Often the tropical species are especially threatened by habitat destruction and overexploitation. At least two species of *Ilex* have become extinct recently, and many others are barely surviving.*[18]

They are extremely important food for numerous species of birds, and also are eaten by other wild animals. In the autumn and early winter the fruits are hard and apparently unpalatable. After being frozen or frosted several times, the fruits soften, and become milder in taste. During winter storms, birds often take refuge in hollies, which provide shelter, protection from predators (by the spiny leaves), and food. The flowers are sometimes eaten by the larva

of the Double-striped Pug moth (*Gymnoscelis rufifasciata*). Other Lepidoptera whose larvae feed on holly include *Bucculatrix ilecella*, which feeds exclusively on hollies, and The Engrailed (*Ectropis crepuscularia*).

30.6 Toxicity

Holly can contain caffeic acid, caffeoyl derivatives, caffeoylshikimic acid, chlorogenic acid, feruloylquinic acid, quercetin, quinic acid, kaempferol, tannins, rutin, caffeine, and theobromine.*[17]*[19]

Holly berries can cause vomiting and diarrhea. They are especially dangerous in cases involving accidental consumption by children attracted to the bright red berries.*[20] Ingestion of over 20 berries may be fatal to children.*[19]*[20]

Holly leaves if eaten might cause diarrhea, nausea, vomiting, and stomach and intestinal problems.*[20]

Holly plants might be toxic to pets and livestock.*[21]

Leaves of some holly species are (or were) used by some cultures to make daily tea. Leaves of other species, such as gallberry (*I. glabra*) are bitter and emetic. *[22] In general little is known about inter-species variation in constituents or toxicity of hollies.

30.7 Ornamental use

Many of the holly species are widely used as ornamental plants in temperate/European gardens and parks, notably:

- *I. aquifolium* (common European holly)
- *I. crenata* (box-leaved holly)
- *I. verticillata* (winterberry)*[23]

Moreover, many hundreds of hybrids and cultivars have been developed for garden use, among them the very popular "Highclere holly", *Ilex* × *altaclerensis* (*I. aquifolium* × *I. perado*) and the "blue holly", *Ilex* × *meserveae* (*I. aquifolium* × *I. rugosa*).*[24] Hollies are often used for hedges; the spiny leaves make them difficult to penetrate, and they take well to pruning and shaping.*[25]

30.8 Culture

Holly – more specifically the European holly, *Ilex aquifolium* – is commonly referenced at Christmas time. In many western cultures, holly is a traditional Christmas decoration, used especially in wreaths and illustrations, for instance on Christmas cards. Since medieval times the plant has carried a Christian symbolism, as expressed in the well-known carol "The Holly and the Ivy". However, the association of holly with winter celebrations almost certainly pre-dates Christianity. Druids wore holly wreaths on their heads.

In heraldry, holly is used to symbolize truth.

The Norwegian municipality of Stord has a yellow twig of holly in its Coat-of-arms.

In the Harry Potter novels, holly is used as the wood in the titular character's wand.

30.9 Selected species

- *Ilex abscondita*
- *Ilex aculeolata*
- *Ilex acutidenticulata*
- *Ilex affinis*

Traditional Christmas card with holly and mistletoe. Circa 1880s

- *Ilex aggregata*
- *Ilex* × *altaclarensis*
- *Ilex altiplana*
- *Ilex amazonensis* –
- *Ilex ambigua* – Sand Holly
- *Ilex amboroica*
- *Ilex amygdalina*
- *Ilex andicola*
- *Ilex angulata*
- *Ilex anodonta*
- *Ilex anomala* Hook. & Arn. – *Kāwa'u* (Hawai'i)* [26]
- *Ilex anonoides*
- *Ilex apicidens*
- *Ilex aquifolium* – European Holly, English Holly, Christ's Thorn
- *Ilex aracamuniana*
- *Ilex archeri*
- *Ilex ardisiifrons*
- *Ilex argentina*
- *Ilex arimensis*

- *Ilex arisanensis*
- *Ilex asprella*
- *Ilex atabapoensis*
- *Ilex atrata*
- *Ilex auriculata*
- *Ilex austrosinensis*
- *Ilex belizensis*
- *Ilex berteroi*
- *Ilex bidens*
- *Ilex bioritsensis*
- *Ilex blanchetii*
- *Ilex boliviana*
- *Ilex brachyphylla*
- *Ilex brandegeeana*
- *Ilex brasiliensis*
- *Ilex brevicuspis*
- *Ilex brevipedicellata*
- *Ilex buergeri*
- *Ilex buxoides*
- *Ilex casiquiarensis*
- *Ilex cassine* – Dahoon Holly, Cassena
- *Ilex cauliflora*
- *Ilex centrochinensis*
- *Ilex chamaebuxus*
- *Ilex chamaedryfolia*
- *Ilex championii*
- *Ilex chapaensis*
- *Ilex chartaceifolia*
- *Ilex chengbuensis*
- *Ilex chengkouensis*
- *Ilex cheniana*
- *Ilex chinensis*
- *Ilex chingiana*
- *Ilex chiriquensis*
- *Ilex chuniana*
- *Ilex ciliolata*

- *Ilex ciliospinosa*
- *Ilex cinerea*
- *Ilex clementis*
- *Ilex cochinchinensis*
- *Ilex colchica*
- *Ilex colombiana*
- *Ilex condensata*
- *Ilex confertiflora*
- *Ilex corallina*
- *Ilex coriacea* – Gallberry
- *Ilex cornuta* – Chinese Holly, Horned Holly
- *Ilex costaricensis*
- *Ilex cowanii*
- *Ilex crenata* – Japanese Holly, Box-leaved Holly, *inutsuge* (Japanese)
- *Ilex cubana*
- *Ilex culmenicola*
- *Ilex cupreonitens*
- *Ilex curtissii*
- *Ilex cuzcoana*
- *Ilex cyrtura*
- *Ilex dabieshanensis*
- *Ilex danielis*
- *Ilex daphnogenea*
- *Ilex dasyclada*
- *Ilex dasyphylla*
- *Ilex davidsei*
- *Ilex decidua* Walter – Possumhaw (Eastern United States, Northeastern Mexico)
- *Ilex dehongensis*
- *Ilex delavayi*
- *Ilex denticulata*
- *Ilex dianguiensis*
- *Ilex dicarpa*
- *Ilex dioica*
- *Ilex diospyroides*
- *Ilex dipyrena* – Himalayan Holly
- *Ilex dicolor*

- *Ilex diuretica*
- *Ilex divaricata*
- *Ilex dolichopoda*
- *Ilex dubia*
- *Ilex dugesii*
- *Ilex duidae*
- *Ilex dumosa*
- *Ilex dunniana*
- *Ilex editicostata*
- *Ilex elliptica*
- *Ilex elmerrilliana*
- *Ilex embelioides*
- *Ilex ericoides*
- *Ilex eoa*
- *Ilex ericoides*
- *Ilex estriata*
- *Ilex euryoides*
- *Ilex excelsa*
- *Ilex fargesii*
- *Ilex fengqingensis*
- *Ilex ficifolia*
- *Ilex ficoidea*
- *Ilex formosana*
- *Ilex forrestii*
- *Ilex fragilis*
- *Ilex franchetiana*
- *Ilex fukeinensis*
- *Ilex gabinetensis*
- *Ilex gabrielleana*
- *Ilex gardneriana* (extinct: 20th century?)
- *Ilex georgei*
- *Ilex gintungensis*
- *Ilex glabella*
- *Ilex glabra* L. A.Gray – Evergreen Winterberry, Bitter Gallberry, Inkberry (Eastern North America)
- *Ilex glaucophylla*
- *Ilex gleasoniana*

- *Ilex glomerata*
- *Ilex godajam*
- *Ilex goshiensis*
- *Ilex graciliflora*
- *Ilex gracilis*
- *Ilex gransabanensis*
- *Ilex guaiquinimae*
- *Ilex guangnanensis*
- *Ilex guayusa* – Guayusa
- *Ilex guianensis*
- *Ilex guizhouensis*
- *Ilex gundlachiana*
- *Ilex haberi*
- *Ilex hainanensis*
- *Ilex hanceana*
- *Ilex hayatana*
- *Ilex hippocrateoides*
- *Ilex hirsuta*
- *Ilex holstii*
- *Ilex hookeri*
- *Ilex huachamacariana*
- *Ilex hualhayoca*
- *Ilex huana*
- *Ilex hylonoma*
- *Ilex hypaneura*
- *Ilex hyreana*
- *Ilex ignicola*
- *Ilex illustris*
- *Ilex integerrima*
- *Ilex integra* – Mochi Tree, Nepal Holly
- *Ilex intricata*
- *Ilex jamaicana* Proctor (Jamaica)
- *Ilex jauaensis*
- *Ilex jelskii*
- *Ilex karuaiana*
- *Ilex khasiana*

- *Ilex kingiana*
- *Ilex kudingcha*
- *Ilex kusanoi*
- *Ilex laevigata* – Smooth Winterberry
- *Ilex lasseri*
- *Ilex latifolia* – Tarajo Holly, *tarayō* (Japanese)
- *Ilex lechleri*
- *Ilex leucoclada*
- *Ilex longipes*
- *Ilex longzhouensis*
- *Ilex machilifolia*
- *Ilex maclurei*
- *Ilex macoucoua*
- *Ilex macrocarpa*
- *Ilex macropoda*
- *Ilex magnifructa*
- *Ilex maingayi*
- *Ilex marahuacae*
- *Ilex marginata*
- *Ilex margratesavage*
- *Ilex mathewsii*
- *Ilex* × *meserveae*
- *Ilex microdonta*
- *Ilex mitis*
- *Ilex montana* Torrey & A.Gray – Mountain Winterberry (Eastern United States)
- *Ilex mucronata* (L.) M.Powell, Savol., & S.Andrews – Mountain Holly, Catberry (Eastern North America)
- *Ilex myrtifolia* – Myrtle Holly, Myrtle Dahoon
- *Ilex neblinensis*
- *Ilex nothofagifolia*
- *Ilex oblonga*
- *Ilex occulta*
- *Ilex opaca* – American Holly (Eastern United States)
- *Ilex ovalifolia*
- *Ilex palawanica*
- *Ilex pallida*
- *Ilex paraguariensis* – Yerba mate (mate, erva-mate)

- *Ilex parvifructa*
- *Ilex patens*
- *Ilex pauciflora*
- *Ilex paujiensis*
- *Ilex pedunculosa* – Longstalked holly
- *Ilex peiradena*
- *Ilex perado* – Madeiran Holly
- *Ilex perlata*
- *Ilex pernyi* – Perny's Holly
- *Ilex polita*
- *Ilex praetermissa*
- *Ilex pringlei*
- *Ilex pseudobuxus*
- *Ilex puberula*
- *Ilex pubescens*
- *Ilex pubiflora*
- *Ilex purpurea*
- *Ilex qianlingshanensis*
- *Ilex quercetorum*
- *Ilex quercifolia*
- *Ilex rarasanensis*
- *Ilex reticulata*
- *Ilex rotunda*
- *Ilex rugosa*
- *Ilex sclerophylla*
- *Ilex serrata* – Japanese Winterberry
- *Ilex sessilifructa*
- *Ilex shimeica*
- *Ilex sikkimensis*
- *Ilex sintenisii* (Urban) Britt. – Sintenis' Holly (Puerto Rico)
- *Ilex sipapoana*
- *Ilex socorroensis*
- *Ilex spinigera*
- *Ilex spruceana*
- *Ilex steyermarkii*
- *Ilex subrotundifolia*

- *Ilex subtriflora*
- *Ilex sugerokii*
- *Ilex sulcata*
- *Ilex syzygiophylla*
- *Ilex tahanensis*
- *Ilex tarapotina*
- *Ilex tateana*
- *Ilex taubertiana*
- *Ilex ternatiflora* (extinct: 20th century?)
- *Ilex theezans*
- *Ilex tiricae*
- *Ilex tolucana*
- *Ilex trachyphylla*
- *Ilex trichocarpa*
- *Ilex tugitakayamensis*
- *Ilex uraiensis*
- *Ilex urbaniana* – Urban's holly
- *Ilex vaccinoides*
- *Ilex venezuelensis*
- *Ilex venulosa*
- *Ilex verticillata* (L.) A.Gray American Winterberry (Eastern North America)
- *Ilex vomitoria* – Yaupon Holly, *casseena* (Spanish)
- *Ilex vulcanicola*
- *Ilex walkeri*
- *Ilex wenchowensis*
- *Ilex williamsii*
- *Ilex wilsonii*
- *Ilex yunnanensis*
- *Ilex wugonshanensis*
- *Ilex yuiana*[*] [27]

30.10 Gallery

- *Ilex anomala*
- A contorted hedgehog holly *Ilex aquifolium 'Ferox'*
- *Ilex chinensis*
- *Ilex pedunculosa*
- *Ilex rotunda*
- *Ilex verticillata*
- *Ilex yunnanensis*
- *Ilex* × *meserveae*
- *Ilex pernyi* from west China.

30.11 References

[1] *Sunset Western Garden Book* 1995:606–607

[2] "Index Nominum Genericorum". 2009-02-05.

[3] "*Kew Plants and Fungi*". 2012-04-11.

[4] *Shorter Oxford English dictionary, 6th ed.* United Kingdom: Oxford University Press. 2007. p. 3804. ISBN 0199206872.

[5] Abbe, Elfriede Martha (1965). *The plants of Virgil's Georgics*. Cornell University Press. p. 88.

[6] Middle English *Holin*, later *Hollen*. Skeat, Walter William (1887). *Principles of English etymology, Volume 1*. London, U.K.: Clarendon Press. p. 371.

[7] T. F. Hoad, *English Etymology*, Oxford University Press, 1993 (ISBN 0-19-283098-8), p. 218b.

[8] Skeat, Walter William (2005). *A Concise Etymological Dictionary of the English Language*. Cosimo, Inc. p. 244. ISBN 978-1-59605-092-1.

[9] etymology of "houx" (French)

[10] Pick, Edward (1869). *An etymological dictionary of the French language*. Murray. p. 106.

[11] Skeat, Walter William (1882). *An etymological dictionary of the English language*. Clarendon Press. p. 269.

[12] Nettleship, Henry (1889). *Contributions to Latin lexicography*. Clarendon Press. p. 27.

[13] Loizeau, P.-A.; Barriera G., Manen J.-F. & Broennimann O. (2005). "Towards an understanding of *Ilex* L. (Aquifoliaceae) on a World-wide scale". In Friis I., Balslev H.,. *Plant diversity and complexity patterns: local, regional, and global dimensions : proceedings of an international symposium held at the Royal Danish Academy of Sciences and Letters in Copenhagen, Denmark, 25–28 May 2003*. Biologiske skrifter **55**. Kongelige Danske videnskabernes selskab. pp. 507–517. ISBN 978-87-7304-304-2. Retrieved 9 April 2012.

[14] Germplasm Resources Information Network: *Ilex mucronata*

[15] Species PPP-index

[16] Powell, M., Savolainen, V., Cuénod, P., Manen, J. F., & Andrews, S. (2000). The mountain holly (*Nemopanthus mucronatus*: Aquifoliaceae) revisited with molecular data. *Kew Bulletin* 55: 341–347.

[17] Alexandra M. Gottlieb, Gustavo C. Giberti & Lidia Poggio (2005). "Molecular analyses of the genus *Ilex* (Aquifoliaceae) in southern South America, evidence from AFLP and ITS sequence data". *American Journal of Botany* **92** (2): 352–369. doi:10.3732/ajb.92.2.352. JSTOR 4123880. PMID 21652411.

[18] International Union for Conservation of Nature and Natural Resources (IUCN) (2007): 2007*IUCN Red List of Threatened Species*:*Ilex*]

[19] "Toxicity of Holly". Retrieved 3 March 2014.

[20] "HOLLY". webmd.com. Retrieved 3 March 2014.

[21] "American Holly". aspca. Retrieved 3 March 2014.

[22] Austin, Daniel F. (2004). *Florida Ethnobotany*. CRC Press. p. 363.

[23] *RHS A-Z encyclopedia of garden plants*. United Kingdom: Dorling Kindersley. 2008. p. 1136. ISBN 1405332964.

[24] Huxley, A., ed. (1992). *New RHS Dictionary of Gardening*. Macmillan ISBN 0-333-47494-5.

[25] Northumbria Police: Security starts at the Garden Gate

[26] Little Jr., Elbert L.; Roger G. Skolmen (1989). "Kāwa'u, Hawaiian holly" (PDF). United States Forest Service.

[27] Ulloa Ulloa & Jørgensen (1993), eFloras.org (2007a, b), IUCN (2007), RBGE (2007), USDA (2007a, b)

30.12 External links

- Eichhorn, Markus (March 2011). "The Holly Tree". *Test Tube*. Brady Haran for the University of Nottingham.

Chapter 31

Ilex aquifolium

Ilex aquifolium (**holly**, **common holly**, **English holly**, **European holly**, or occasionally **Christmas holly**), is a species of holly native to western and southern Europe, northwest Africa, and southwest Asia.*[1]*[2]*[3]*[4] *I. aquifolium* is the species familiar in Christmas decoration, and is regarded as the type species of the genus *Ilex*, which by association is also called "holly". It is a dioecious tree or shrub found, for example, in shady areas of forests of oak and in beech hedges. It has a great capacity to adapt to different conditions and is a pioneer species that repopulates the margins of forests or clearcuts.

As a tree, it can exceed 10 m in height. It is usually found as a shrub or a small tree about 1 m tall with a straight trunk and pyramidal crown, which branches from the base. It is slow growing and it does not usually fully mature due to grazing, cutting, or fire. It can live 500 years, but usually does not reach 100.

31.1 Description

European holly foliage with berries

Holly is an evergreen tree growing to 10–25 m tall with a woody stem as large as 40–80 cm, rarely 1 m or more, in

European holly flowers; male above, female below (leaves cut to show flowers more clearly)

diameter The leaves are 5–12 cm long and 2–6 cm broad; they are evergreen, lasting about five years, and are dark green on the upper surface and lighter on the underside, oval, leathery, shiny, and about 5 to 9 cm long. In the young and in the lower limbs of mature trees, the leaves have three to five sharp spines on each side, pointing alternately upward and downward, while leaves of the upper branches in mature trees lack spines.*[3]*[4]

The flowers are white, four-lobed, and pollinated by bees. Holly is dioecious, meaning that there are male plants and female plants. The sex cannot be determined until the plants begin flowering, usually between 4 and 12 years of age. In male specimens, the flowers are yellowish and appear in axillary groups. In the female, flowers are isolated or in groups of three and are small and white or slightly pink, and consist of four petals and four sepals partially fused at the base.

The fruit is a red drupe, about 6–10 mm in diameter, a bright red or bright yellow, which matures around October or November; at this time they are very bitter due to the ilicin content*[5] and so are rarely eaten until late winter after frost has made them softer and more palatable. They are eaten by rodents, birds and larger herbivores. Each fruit contains 3 to 4 seeds which do not germinate until the second or third spring.*[6] The fruit only appears on female plants, which require male plants nearby to fertilise them.

31.2 Distribution

Today, holly is found in western Asia and Europe in the undergrowth of oak forest and beech forest in particular, although at times it can form a dense thicket as the dominant species. It requires moist, shady environments, found within forests or in shady slopes, cliffs, and mountain gorges. *[1]*[2]*[3]*[4]

During the Cenozoic Era, the Mediterranean region, Europe, and northwest Africa had a wetter climate and were largely covered by laurel forests. Holly was a typical representative species of this biome, where many current species of the genus *Ilex* were present. With the drying of the Mediterranean Basin during the Pliocene, the laurel forests gradually retreated, replaced by more drought-tolerant sclerophyll plant communities. The modern *Ilex aquifolium* resulted from this change. Most of the last remaining laurel forests around the Mediterranean are believed to have died out approximately 10,000 years ago at the end of the Pleistocene.

31.3 Ecology

Holly is a rugged pioneer species that preserves and enriches the soil facilitating colonization by others. It is an ecological indicator of a well-preserved or recovering area with little human intrusion. It prefers relatively moist areas, up to 600m in elevation, and tolerates Mediterranean summer drought and frost. The plant is common in the garrigue and maquis and is also found in deciduous forest and oak forest.

Pure stands of hollies can grow into a labyrinth of vaults in which thrushes and deer take refuge, while smaller birds are protected among their spiny leaves. After the first frost of the season, hollies' fruit becomes soft and falls to the ground serving as important food for winter birds at a time of scarce resources.

The flowers are attractive as nectar sources for insects such as bees, wasps, flies, and small butterflies.

It is an invasive species on the West Coast of the United States and Hawaii.*[7]*[8]

31.4 Cultivation

Cultivated specimen in North America

Ilex aquifolium, the familiar holly of Christmas cards and wreaths, is widely grown in parks and gardens in temperate regions. Both male and female specimens must be grown together to ensure berries (drupes), which are produced only by female plants.*[9] Numerous cultivars have been selected, of which the following have gained the Royal Horticultural Society's Award of Garden Merit (RHS AGM):-

The hybrid *Ilex* x *altaclerensis* was developed at Highclere Castle in 1835, a cross between *I. aquifolium* and the tender species *I. perado*. The following cultivars have gained the RHS AGM:-

One of several variegated cultivars

31.5 Chemistry and toxicity, medicinal and food uses

Holly **berries** contain alkaloids, caffeine, and theobromine and are generally regarded as toxic to humans, though their poisonous properties are overstated and fatalities almost unknown. Accidental consumption may occur by children or pets attracted to the bright red berries. The berries are emetic. This is described as being due to the drug ilicin,*[25] though caffeine and theobromine found throughout the plant are much more toxic, generally, to dogs and cats.

The **leaves** of related plants are used to make a caffeine-rich beverage, Yerba Mate, which has caffeine in amounts equal to that of coffee. It is likely that *I. aquifolium* has equal amounts of caffeine in the leaves. It is described "The leaves of Holly have been employed in the Black Forest as a substitute for tea" *[26]

Holly is rarely used **medicinally**, but is diuretic, relieves fevers, and has a laxative action.*[27]

Ilex aquifolium also contains saponins, theobromine (a xanthine), ilicin, caffeine, caffeic acid, and a yellow pigment, ilexanthin.*[28] *[29]*[30]

31.6 Other uses

Many hundreds of hybrids and cultivars have been developed for garden use, among them the very popular "Highclere holly" , *Ilex* × *altaclerensis* (*I. aquifolium* × *I. perado*) and the "blue holly" , *Ilex* × *meserveae* (*I. aquifolium* × *I. rugosa*).*[31] Hollies are often used for hedges; the spiny leaves make them difficult to penetrate, and they take well to pruning and shaping.*[32]

Between the thirteenth and eighteenth centuries, before the introduction of turnips, Ilex aquifolium was cultivated for use as winter fodder for cattle and sheep.[28] Less spiny varieties of holly were preferred, and in practice the leaves growing near the top of the tree have far fewer spines making them more suitable for fodder.

Ilex aquifolium was once among the traditional woods for Great Highland bagpipes before tastes turned to imported dense tropical woods such as cocuswood, ebony, and African blackwood.[29]

31.7 References

[1] Flora Europaea: *Ilex aquifolium*

[2] Med-Checklist: *Ilex aquifolium*

[3] Rushforth, K. (1999). *Trees of Britain and Europe*. Collins ISBN 0-00-220013-9.

[4] Flora of NW Europe: *Ilex aquifolium*

[5] Heinz, A. (1975). *Drogenkunde*. W. de Gruyter ISBN 3-13-566001-X

[6] Peterken, G. F.; Lloyd, P. S. (November 1967). "Ilex aquifolium L.". *Journal of Ecology* **55** (3): 841–858. doi:10.2307/2258429.

[7] "*Ilex aquifolium* (English holly)". California Invasive Plant Council. Retrieved 2011-01-30.

[8] "English Holly - *Ilex aquifolium*". King County, Washington. Retrieved 2011-01-30.

[9] *RHS A-Z encyclopedia of garden plants*. United Kingdom: Dorling Kindersley. 2008. p. 1136. ISBN 1405332964.

[10] "RHS Plant Selector Ilex aquifolium AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2013-01-13.

[11] "RHS Plant Selector Ilex aquifolium 'Amber' (f) AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2013-01-13.

[12] "RHS Plant Selector Ilex aquifolium 'Argentea Marginata' (f/v) AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2013-01-13.

[13] "RHS Plant Selector Ilex aquifolium 'Ferox Argentea' (m/v) AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2013-01-13.

[14] "RHS Plant Selector Ilex aquifolium 'Golden Queen' (m/v) AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2013-01-13.

[15] "RHS Plant Selector Ilex aquifolium 'Handsworth New Silver' (f/v) AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2013-01-13.

[16] "RHS Plant Selector Ilex aquifolium 'J.C. van Tol' (f) AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2013-01-13.

[17] "RHS Plant Selector Ilex aquifolium 'Madame Briot' (f/v) AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2013-01-13.

[18] "RHS Plant Selector Ilex aquifolium 'Myrtifolia Aurea Maculata' (m/v) AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2013-01-13.

[19] "RHS Plant Selector Ilex aquifolium 'Pyramidalis' (f) AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2013-01-13.

[20] "RHS Plant Selector Ilex aquifolium 'Silver Queen' (m/v) AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2013-01-13.

[21] "RHS Plant Selector Ilex × altaclerensis 'Belgica Aurea' (f/v) AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2013-01-13.

[22] "RHS Plant Selector Ilex × altaclerensis 'Camelliifolia' (f) AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2013-01-13.

[23] "RHS Plant Selector Ilex × altaclerensis 'Golden King' (f/v) AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2013-01-13.

[24] "RHS Plant Selector Ilex × altaclerensis 'Lawsoniana' (f/v) AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2013-01-13.

[25] Kress, Henriette. "Henriette's herbal". Henriette Kress. Retrieved 2014-02-26.

[26] Grieve. "Grieve Herbal". *Grieve Herbal*. Grieve. Retrieved 2014-02-26.

[27] Wren, R.C. (1988). *Potter's New Cyclopedia of Botanical Drugs and Preparations*. C.W. Daniel ISBN 0-85207-197-3.

[28] Heinz, A. (1975). *Drogenkunde*. W. de Gruyter

[29] Leikin, Jerrold Blair; Frank P. Paloucek (2002). *Poisoning & Toxicology Handbook, Third Edition*. Hudson, Ohio USA: Lexi-Comp Inc. p. 80. ISBN 978-1-930598-77-5.

[30] Turner, Nancy J.; P. von Aderkas (2009). *The North American Guide to Common Poisonous Plants and Mushrooms*. Timberpress. p. 210. ISBN 978-0-88192-929-4.

[31] Huxley, A., ed. (1992). *New RHS Dictionary of Gardening*. Macmillan ISBN 0-333-47494-5.

[32] Northumbria Police: Security starts at the Garden Gate

31.8 External links

- Commentary and video of Male Holly Tree.

Chapter 32

Juniper

For other uses, see Juniper (disambiguation).

Junipers are coniferous plants in the genus ***Juniperus*** /dʒuːˈnɪpərəs/* [1] of the cypress family Cupressaceae. Depending on taxonomic viewpoint, between 50 and 67 species of juniper are widely distributed throughout the Northern Hemisphere, from the Arctic, south to tropical Africa in the Old World, and to the mountains of Central America.

32.1 Description

For more details on this topic, see Juniper berry.
Junipers vary in size and shape from tall trees, 20–40 m (66–131 ft) tall, to columnar or low spreading shrubs with

Cones and leaves of Juniperus communis

long trailing branches. They are evergreen with needle-like and/or scale-like leaves. They can be either monoecious or dioecious. The female seed cones are very distinctive, with fleshy, fruit-like coalescing scales which fuse together to form a "berry"-like structure, 4–27 mm (0.16–1.06 in) long, with 1–12 unwinged, hard-shelled seeds. In some species these "berries" are red-brown or orange but in most they are blue; they are often aromatic and can be used as a spice. The seed maturation time varies between species from 6–18 months after pollination. The male cones are similar to those of other Cupressaceae, with 6–20 scales.

In zones 7 through 10, junipers can bloom and release pollen several times each year. A few species of juniper bloom in autumn, while most species pollinate from early winter until late spring.* [2]

Detail of Juniperus chinensis *shoots, with juvenile (needle-like) leaves (left), and adult scale leaves and immature male cones (right)*

Many junipers (e.g. *J. chinensis*, *J. virginiana*) have two types of leaves: seedlings and some twigs of older trees have needle-like leaves 5–25 mm (0.20–0.98 in) long; and the leaves on mature plants are (mostly) tiny (2–4 mm (0.079–0.157 in)), overlapping and scale-like. When juvenile foliage occurs on mature plants, it is most often found on shaded shoots, with adult foliage in full sunlight. Leaves on fast-growing 'whip' shoots are often intermediate between juvenile and adult.

In some species (e. g. *J. communis*, *J. squamata*), all the foliage is of the juvenile needle-like type, with no scale leaves. In some of these (e.g. *J. communis*), the needles are jointed at the base, in others (e.g. *J. squamata*), the needles merge smoothly with the stem, not jointed.

The needle-leaves of junipers are hard and sharp, making the juvenile foliage very prickly to handle. This can be a valuable identification feature in seedlings, as the otherwise very similar juvenile foliage of cypresses (*Cupressus, Chamaecyparis*) and other related genera is soft and not prickly.

Juniper is the exclusive food plant of the larvae of some Lepidoptera species including *Bucculatrix inusitata* and juniper carpet, and is also eaten by the larvae of other Lepidoptera species such as *Chionodes electella*, *Chionodes viduella*, juniper pug and pine beauty; those of the tortrix moth *C. duplicana* feed on the bark around injuries or canker.

32.2 Classification

Juniper needles, magnified. Left, Juniperus communis *(*Juniperus *sect.* Juniperus*; note needles 'jointed' at base). Right,* Juniperus chinensis *(*Juniperus *sect.* Sabina*; note needles merging smoothly with the stem, not jointed at base).*

The number of juniper species is in dispute, with two recent studies giving very different totals, Farjon (2001) accepting 52 species, and Adams (2004) accepting 67 species. The junipers are divided into several sections, though (particularly among the scale-leaved species) which species belong to which sections is still far from clear, with research still on-going. The section *Juniperus* is an obvious monophyletic group though.

- ***Juniperus* sect. *Juniperus*:** Needle-leaf junipers. The adult leaves are needle-like, in whorls of three, and jointed at the base (see below right).
  - *Juniperus* sect. *Juniperus* subsect. *Juniperus*: Cones with 3 separate seeds; needles with one stomatal band.
    - *Juniperus communis* - Common Juniper
      - *Juniperus communis* subsp. *alpina* - Alpine Juniper
    - *Juniperus conferta* - Shore Juniper (syn. *J. rigida* var. *conferta*)
    - *Juniperus rigida* - Temple Juniper or Needle Juniper

Juniperus phoenicea *on El Hierro, Canary Islands*

An Eastern Juniper in October laden with ripe cones.

Cones and seeds.

- *Juniperus* sect. *Juniperus* subsect. *Oxycedrus*: Cones with 3 separate seeds; needles with two stomatal bands.
  - *Juniperus brevifolia* - Azores Juniper
  - *Juniperus cedrus* - Canary Islands Juniper
  - *Juniperus deltoides* - Eastern Prickly Juniper
  - *Juniperus formosana* - Chinese Prickly Juniper
  - *Juniperus lutchuensis* - Ryukyu Juniper
  - *Juniperus navicularis* - Portuguese Prickly Juniper
  - *Juniperus oxycedrus* - Western Prickly Juniper or Cade Juniper
  - *Juniperus macrocarpa* (*J. oxycedrus* subsp. *macrocarpa*) - Large-berry Juniper
- *Juniperus* sect. *Juniperus* subsect. *Caryocedrus*: Cones with 3 seeds fused together; needles with two stomatal bands.
  - *Juniperus drupacea* - Syrian Juniper

- ***Juniperus* sect. *Sabina*:** Scale-leaf junipers. The adult leaves are mostly scale-like, similar to those of *Cupressus* species, in opposite pairs or whorls of three, and the juvenile needle-like leaves are not jointed at the base (including in the few that have only needle-like leaves; see below right). Provisionally, all the other junipers are included here, though they form a paraphyletic group.
  - **Old World species**
    - *Juniperus chinensis* - Chinese Juniper
      - *Juniperus chinensis* var. *sargentii* - Sargent's Juniper (Japanese: 深山柏槇)
      - *Juniperus chinensis* L. var. *tsukusiensis Masummune* (Chinese: 清水圓柏)
      - *Juniperus chinensis Kaizuka* (Japanese: 貝塚伊吹)
      - *Juniperus chinensis* var. *Procumbens* (Japanese: 這柏槇)
      - *Juniperus chinensis Globosa* (Japanese: 玉伊吹)
      - *Juniperus chinensis Aurea'* (Japanese: 金伊吹)
    - *Juniperus convallium* - Mekong Juniper
    - *Juniperus excelsa* - Greek Juniper

Juniperus occidentalis *var.* australis*, eastern Sierra Nevada, Rock Creek Canyon, California.*

- *Juniperus excelsa polycarpos* - Persian Juniper
- *Juniperus foetidissima* - Stinking Juniper
- *Juniperus indica* - Black Juniper
- *Juniperus komarovii* - Komarov's Juniper

Juniperus communis *wood pieces, with a U.S. penny for scale, showing the narrow growth rings of the species.*

- *Juniperus phoenicea* - Phoenician Juniper
- *Juniperus pingii* - Ping Juniper
  - *Juniperus pingii* var. *chengii*
  - *Juniperus pingii* var. *miehei*
  - Juniperus pingii var. *wilsonii*
- *Juniperus procera* - East African Juniper
- *Juniperus procumbens* - Ibuki Juniper
- *Juniperus pseudosabina* - Xinjiang Juniper
- *Juniperus recurva* - Himalayan Juniper
  - *Juniperus recurva* var. *butanica*
  - *Juniperus recurva* var. *coxii* - Cox's Juniper
- *Juniperus sabina* - Savin Juniper
  - *Juniperus sabina* var. *davurica* - Daurian Juniper
- *Juniperus saltuaria* - Sichuan Juniper
- *Juniperus semiglobosa* - Russian Juniper
- *Juniperus squamata* - Flaky Juniper
- *Juniperus thurifera* - Spanish Juniper
- *Juniperus tibetica* - Tibetan Juniper
- *Juniperus wallichiana* - Himalayan Black Juniper

- **New World species**
  - *Juniperus angosturana* - Mexican One-seed Juniper
  - *Juniperus ashei* - Ashe Juniper
  - *Juniperus arizonica* - Synonym: Juniperus coahuilensis var. arizonica or Juniperus erythrocarpa var. coahuilensis. common names: Redberry Juniper, Roseberry Juniper
  - *Juniperus barbadensis* - West Indies Juniper
  - *Juniperus bermudiana* - Bermuda Juniper
  - *Juniperus blancoi* - Blanco's Juniper
  - *Juniperus californica* - California Juniper
  - *Juniperus coahuilensis* - Coahuila Juniper
  - *Juniperus comitana* - Comitán Juniper
  - *Juniperus deppeana* - Alligator Juniper

- *Juniperus durangensis* - Durango Juniper
- *Juniperus flaccida* - Mexican Weeping Juniper
- *Juniperus gamboana* - Gamboa Juniper
- *Juniperus horizontalis* - Creeping Juniper
- *Juniperus jaliscana* - Jalisco Juniper
- *Juniperus monosperma* - One-seed Juniper
- *Juniperus monticola* - Mountain Juniper
- *Juniperus occidentalis* - Western Juniper
  - *Juniperus occidentalis* subsp. *australis* - Sierra Juniper
- *Juniperus osteosperma* - Utah Juniper
- *Juniperus pinchotii* - Pinchot Juniper
- *Juniperus saltillensis* - Saltillo Juniper
- *Juniperus scopulorum* - Rocky Mountain Juniper
- *Juniperus standleyi* - Standley's Juniper
- *Juniperus virginiana* - Eastern Juniper (Eastern Redcedar)
  - *Juniperus virginiana* subsp. *silicicola* - Southern Juniper
- *Juniperus zanonii* (proposed) *[3]

32.3 Cultivation and uses

Juniper berries are a spice used in a wide variety of culinary dishes and best known for the primary flavoring in gin (and responsible for gin's name, which is a shortening of the Dutch word for juniper, *genever*). Juniper berries are also used as the primary flavor in the liquor Jenever and sahti-style of beers. Juniper berry sauce is often a popular flavoring choice for quail, pheasant, veal, rabbit, venison and other meat dishes.

Many of the earliest prehistoric people lived in or near juniper forests which furnished them food, fuel, and wood for shelter or utensils. Many species, such as *J. chinensis* (Chinese Juniper) from eastern Asia, are extensively used in landscaping and horticulture, and as one of the most popular species for use in bonsai. It is also a symbol of longevity, strength, athleticism, and fertility.

Some junipers are susceptible to *Gymnosporangium* rust disease, and can be a serious problem for those people growing apple trees, the alternate host of the disease.

Some junipers are given the common name "cedar," including *Juniperus virginiana*, the "red cedar" that is used widely in cedar drawers. "Eastern redcedar" is the correct name for *J. virginiana*. The lack of space between the words "red" and "cedar" indicate that this species is not a true cedar, Cedrus.

In Morocco, the tar (gitran) of the arar tree (Juniperus phoenicea) is applied in dotted patterns on bisque drinking cups. Gitran makes the water more fragrant and is said to be good for the teeth.

Some Indigenous peoples, such as the Dineh, have traditionally used juniper to treat diabetes.*[4] Animal studies have shown that treatment with juniper may retard the development of streptozotocin-induced diabetes in mice.*[5] Native Americans have also used juniper berries as a female contraceptive.*[6] The 17th Century herbalist physician Nicholas Culpeper recommended the ripened berries for conditions such as asthma and sciatica, as well as to speed childbirth.*[7]

Juniper is one of the plants used in Scottish and Gaelic Polytheist saining rites, such as those performed at Hogmanay (New Year), where the smoke of burning juniper is used to cleanse, bless and protect the household and its inhabitants.*[8]*[9]*[10]

Juniper berries are steam distilled to produce an essential oil that may vary from colorless to yellow or pale green. Some of its chemical components are alpha pinene, cadinene, camphene and terpineol. Leaves and twigs of Juniperus virginiana are steam distilled to produce oil of juniper. Middle Tennessee and adjacent northern Alabama and southern Kentucky are the centers for this activity. The U.S. Forest Service has provided plans for the apparatus required. This work is typically done during periods of cold weather to reduce the loss of essential oil to evaporation, which is greater in warmer weather, and to take advantage of a time of year when labor might be more readily available.

Juniper in weave is a traditional cladding technique used in Northern Europe, e.g. at Havrå, Norway.*[11]

*Juniper (*Juniperus osteosperma *and* scopulorum*) essential oil*

32.4 Allergenic potential

In drier areas, juniper pollen easily becomes airborne and can be inhaled into the lungs. This pollen can also irritate the skin and cause contact dermatitis. Cross-allergenic reactions are common between juniper pollen and the pollen of all species of cypress.*[2]

Monoecious juniper plants are highly allergenic, with an OPALS allergy scale rating of 9 out of 10. Completely male juniper plants have an OPALS rating of 10, and release abundant amounts of pollen. Conversely, all-female juniper plants have an OPALS rating of 1, and are considered "allergy-fighting".*[2]

32.5 Footnotes

[1] *Sunset Western Garden Book,* 1995:606–607

[2] Ogren, Thomas (2015). *The Allergy-Fighting Garden*. Berkeley, CA: Ten Speed Press. pp. 131–133. ISBN 978-1-60774-491-7.

[3] Adams, Robert. "Phytologia (April 2010) 92(1)" (PDF).

[4] McCabe, Melvina; Gohdes, Dorothy; Morgan, Frank; Eakin, Joanne; Sanders, Margaret; Schmitt, Cheryl (2005). "Herbal Therapies and Diabetes Among Navajo Indians". *Diabetes Care* **28** (6): 1534–1535. doi:10.2337/diacare.28.6.1534-a.

[5] Swanston-Flatt, S. K.; Day, C.; Bailey, C. J.; Flatt, P. R. (1990). "Traditional plant treatments for diabetes. Studies in normal and streptozotocin diabetic mice". *Diabetologia* **33** (8): 462–464. doi:10.1007/BF00405106. PMID 2210118.

[6] Tilford, Gregory L. (1997). *Edible and Medicinal Plants of the West.* Mountain Press Publishing Company. ISBN 0-87842-359-1.

[7] Culpeper, Nicholas (1985). *Culpeper's Complete Herbal*. Godfrey Cave Associates. ISBN 1-85007-026-1.

[8] McNeill, F. Marian (1961). "X Hogmany Rites and Superstitions". *The Silver Bough, Vol.3: A Calendar of Scottish National Festivals, Halloween to Yule*. Glasgow: William MacLellan. p. 113. ISBN 0-948474-04-1.

[9] Loughlin, Annie "Saining" at Tairis UK. Accessed 8-6-14

[10] Loughlin, Annie "Saining Ritual" at Tairis UK. Accessed 8-6-14

[11] Berge, Bjørn (2009). *The Ecology of Building Materials* (2nd ed.). Taylor & Francis. ISBN 978-1-85617-537-1.

32.6 References

- Adams, R. P. (2004). *Junipers of the World: The genus Juniperus.* Victoria: Trafford. ISBN 1-4120-4250-X
- Farjon, A. (2001). *World Checklist and Bibliography of Conifers.* Kew. ISBN 1-84246-025-0
- Farjon, A. (2005). *Monograph of Cupressaceae and Sciadopitys.* Royal Botanic Gardens, Kew. ISBN 1-84246-068-4
- Mao, K., Hao, G., Liu J., Adams, R. P. and R. I., Milne. (2010). Diversification and biogeography of *Juniperus* (Cupressaceae): variable diversification rates and multiple intercontinental dispersals. *New Phytologist* 188(1): 254-272.

32.7 External links

- Junipers of the world
- Gymnosperm Database - *Juniperus*
- Arboretum de Villardebelle Photos of cones and foliage of selected species
- "Juniper". *Encyclopædia Britannica* (11th ed.). 1911.
- "Juniper". *Encyclopedia Americana*. 1920.

Chapter 33

Juniperus communis

Juniperus communis, the **common juniper**, is a species in the genus *Juniperus*, in the family Cupressaceae. It has the largest range of any woody plant, throughout the cool temperate Northern Hemisphere from the Arctic south in mountains to around 30°N latitude in North America, Europe and Asia.

33.1 Description

Juniperus communis *subsp.* alpina*, in Vitosha, Bulgaria*

Juniperus communis is a shrub or small coniferous evergreen tree, very variable and often a low spreading shrub, but occasionally reaching 10 m tall. It has needle-like leaves in whorls of three; the leaves are green, with a single white stomatal band on the inner surface. It is dioecious, with male and female cones on separate plants, which are wind pollinated.

The seed cones are berry-like, green ripening in 18 months to purple-black with a blue waxy coating; they are spherical, 4–12 mm diameter, and usually have three (occasionally six) fused scales, each scale with a single seed. The seeds are dispersed when birds eat the cones, digesting the fleshy scales and passing the hard seeds in their droppings. The male cones are yellow, 2–3 mm long, and fall soon after shedding their pollen in March–April.*[2]*[3]*[4]

33.1.1 Subspecies

As to be expected from the wide range, *J. communis* is very variable, with several infraspecific taxa; delimitation between the taxa is still uncertain, with genetic data not matching morphological data well.*[2]*[3]*[4]*[5]*[6]*[7]*[8]*[9]

- subsp. *communis* – Common juniper. Usually an erect shrub or small tree; leaves long, 8–20(–27) mm; cones small, 5–8 mm, usually shorter than the leaves; found at low to moderate altitude in temperate climates.
  - subsp. *communis* var. *communis* – Europe, most of northern Asia
  - subsp. *communis* var. *depressa* Pursh – North America, Sierra Nevada in California
  - subsp. *communis* var. *hemisphaerica* (J.Presl & C.Presl) Parl. – Mediterranean mountains
  - subsp. *communis* var. *nipponica* (Maxim.) E.H.Wilson – Japan (status uncertain, often treated as *J. rigida* var. *nipponica*)
- subsp. *alpina* (Suter) Čelak. – **alpine juniper** (syn. *J. c.* subsp. *nana*, *J. c.* var. *saxatilis* Pallas, *J. sibirica* Burgsd.). Usually a prostrate ground-hugging shrub; leaves short, 3–8 mm; cones often larger, 7–12 mm, usually longer than the leaves; found in subarctic areas and high altitude alpine zones in temperate areas.
  - subsp. *alpina* var. *alpina* – Greenland, Europe and Asia
  - subsp. *alpina* var. *megistocarpa* Fernald & H.St.John – Eastern Canada (doubtfully distinct from var. *alpina*)
  - subsp. *alpina* var. *jackii* Rehder – Western North America (doubtfully distinct from var. *alpina*)

Some botanists treat subsp. *alpina* at the lower rank of variety, in which case the correct name is *Juniperus communis* var. *saxatilis* Pallas,*[3] though the name *Juniperus communis* var. *montana* is also occasionally cited; others, primarily in eastern Europe and Russia, sometimes treat it as a distinct species *J. sibirica* Burgsd. (syn. *J. nana* Willd., *J. alpina* S.F.Gray).*[10]

Juniperus communis is one of Ireland's longest established plants.*[11]

33.2 Uses

33.2.1 Cultivation

Juniperus communis is cultivated in the horticulture trade and used as an evergreen ornamental shrub in gardens. The following cultivars have gained the Royal Horticultural Society's Award of Garden Merit:-

- 'Hibernica'*[12] (Irish juniper)
- 'Hornibrookii'*[13]
- 'Repanda'*[14] (prostrate form)

33.2.2 Crafts

It is too small to have any general lumber usage. In Scandinavia, however, juniper wood is used for making containers for storing small quantities of dairy products such as butter and cheese, and also for making wooden butter knives. It was also frequently used for trenails in wooden shipbuilding by shipwrights for its tough properties.

In Estonia juniper wood is valued for its long lasting and pleasant aroma, very decorative natural structure of wood (growth rings) as well as good physical properties of wood due to slow growth rate of juniper and resulting dense

Foliage and berries

Juniperus communis *wood pieces, with a U.S. penny for scale, showing the narrow growth rings of the species.*

and strong wood. Various decorative items (often eating utensils) are common in most Estonian handicraft shops and households.

According to the old tradition, on Easter Monday Kashubian (Northern Poland) boys chase girls whipping their legs gently with juniper twigs. This is to bring good fortune in love to the chased girls.

33.2.3 Culinary

Its astringent blue-black seed cones, commonly known as "juniper berries", are too bitter to eat raw and are usually sold dried and used to flavour meats, sauces, and stuffings. They are generally crushed before use to release their flavour. Since juniper berries have a strong taste, they should be used sparingly. They are generally used to enhance meat with a strong flavour, such as game, including game birds, or tongue.

The cones are used to flavour certain beers and gin (the word "gin" derives from an Old French word meaning "juniper").*[15] In Finland, juniper is used as a key ingredient in making sahti, a traditional Finnish ale. Also the Slovak alcoholic beverage Borovička and Dutch Genever are flavoured with juniper berry or its extract.

Juniper is used in the traditional farmhouse ales of Norway,*[16] Sweden,*[17] Finland,*[18] Estonia, and Latvia. In Norway, the beer is brewed with juniper infusion instead of water, while in the other countries the juniper twigs are mainly used in the mash, as filters to prevent the crushed malts from clogging the outlet of the mashing tun.

33.2.4 Traditional medicine

Juniper berries have long been used as medicine by many cultures including the Navajo people.*[19] Western American tribes combined the berries of *Juniperus communis* with *Berberis* root bark in a herbal tea. Native Americans also used juniper berries as a female contraceptive.*[20]

33.3 Gallery

- As the cones need more than a year to become ripe, both ripe and unripe cones can be seen together, as on this tree on Saaremaa, Estonia
- *Juniperus communis* subsp. *communis* on Lüneburg Heath, Germany
- Young shoots, Malá Fatra

33.4 References

[1] Conifer Specialist Group 1998. Juniperus communis. In: IUCN 2009. IUCN Red List of Threatened Species. Version 2009.2. <www.iucnredlist.org>. Downloaded on 3 March 2010.

[2] Rushforth, K. (1987). *Conifers*. Helm ISBN 0-7470-2801-X.

[3] Adams, R. P. (2004). *Junipers of the World: The genus Juniperus*. Victoria: Trafford. ISBN 1-4120-4250-X.

[4] Arboretum de Villardebelle: *Juniperus*

[5] Flora Europaea: *Juniperus communis*

[6] Adams, R. P., Pandey, R. N., Leverenz, J. W., Dignard, N., Hoegh, K., & Thorfinnsson, T. (2003). Pan-Arctic variation in Juniperus communis: Historical Biogeography based on DNA fingerprinting. *Biochem. Syst. Ecol.* 31: 181-192 pdf file.

[7] Adams, R. P., & Pandey, R. N. (2003). Analysis of Juniperus communis and its varieties based on DNA fingerprinting. *Biochem. Syst. Ecol.* 31: 1271-1278. pdf file

[8] Adams, R. P., & Nguyen, S. (2007). Post-Pleistocene geographic variation in Juniperus communis in North America. *Phytologia* 89 (1): 43-57. pdf file

[9] Den Virtuella Floran: *Juniperus communis* distribution

[10] Association Ecosystem (Russia): *Juniperus sibirica*

[11] Preston, S. J.; Wilson, C.; Jennings, S.; Provan, J.; McDonald, R. A. (2007). "The status of *Juniperus communis* L. in Northern Ireland in 2005". *Ir. Nat. J.* **28**: 372–378.

[12] "RHS Plant Selector - *Juniperus communis* 'Hibernica'". Royal Horticultural Society. Retrieved 20 May 2013.

[13] "RHS Plant Selector - *Juniperus communis* 'Hornibrookii'". Royal Horticultural Society. Retrieved 20 May 2013.

[14] "RHS Plant Selector - *Juniperus communis* 'Repanda'". Royal Horticultural Society. Retrieved 20 May 2013.

[15] *Shorter Oxford English dictionary, 6th ed.* United Kingdom: Oxford University Press. 2007. p. 3804. ISBN 0199206872.

[16] Brewing and beer traditions in Norway: The social anthropological background of the brewing industry, Odd Nordland, Universitetsforlaget, 1969.

[17] Gotlandsdricka: Traditionell kultur som regional identitetssymbol, Anders Salomonsson, Skrifter utg. av Etnologiska sallskapet i Lund, 1979, ISBN 917400106X .

[18] Vom Halm zum Fass: Die volkstumlichen Alkoholarmen : Getreidegetranke in Finnland, Matti Räsänen, Kansatieteellinen arkisto, 1975.

[19] McCabe, Melvina; Gohdes, Dorothy; Morgan, Frank; Eakin, Joanne; Sanders, Margaret; Schmitt, Cheryl (2005). "Herbal Therapies and Diabetes Among Navajo Indians" . *Diabetes Care* **28** (6): 1534–1535. doi:10.2337/diacare.28.6.1534-a.

[20] Tilford, Gregory L. (1997). *Edible and Medicinal Plants of the West.* Mountain Press Publishing Company. ISBN 0-87842-359-1.

33.5 Further reading

- Conifer Specialist Group (1998). *Juniperus communis*. 2006. *IUCN Red List of Threatened Species*. IUCN 2006. www.iucnredlist.org. Retrieved on 12 May 2006. Database entry includes a brief justification of why this species is of least concern

33.6 External links

- USDA: *Juniperus communis*
- Jepson Manual Treatment - *Juniperus communis*
- *Juniperus communis* - Photo Gallery

Chapter 34

Tilia

"Basswood" redirects here. For other uses, see Basswood (disambiguation).
"Lime tree" redirects here. For the citrus fruit trees, see Lime (fruit).

Tilia is a genus of about 30 species of trees native throughout most of the temperate Northern Hemisphere. Commonly called **lime trees** in the British Isles, they are not closely related to the lime fruit. Other names include **linden** and **basswood**. The genus occurs in Europe and eastern North America, but the greatest species diversity is found in Asia. Under the Cronquist classification system, this genus was placed in the family Tiliaceae, but genetic research summarized by the Angiosperm Phylogeny Group has resulted in the incorporation of this genus into the Malvaceae.

Tilia species are mostly large, deciduous trees, reaching typically 20 to 40 metres (66 to 130 ft) tall, with oblique-cordate leaves 6 to 20 centimetres (2 to 8 in) across. As with elms, the exact number of species is uncertain, as many if not most of the species will hybridise readily, both in the wild and in cultivation. Limes are hermaphroditic, having perfect flowers with both male and female parts, pollinated by insects.

34.1 Name

The genus is generally called *lime* or *linden* in Britain*[1] and *linden*, *lime*, or *basswood* in North America.*[2]

"Lime" is an altered form of Middle English *lind*, in the 16th century also *line*, from Old English feminine *lind* or *linde*, Proto-Germanic **lendā*, cognate to Latin *lentus* "flexible" and Sanskrit *latā* "liana". Within Germanic languages, English "lithe", German *lind* "lenient, yielding" are from the same root.

"Linden" was originally the adjective, "made from lime-wood" (equivalent to "wooden"); from the late 16th century, "linden" was also used as a noun, probably influenced by translations of German romance, as an adoption of *Linden*, the plural of German *Linde*.*[3] Neither the name nor the tree is related to the citrus fruit called "lime" (*Citrus aurantifolia*, family Rutaceae). Another common name used in North America is basswood, derived from *bast*, the name for the inner bark (see Uses, below). Teil is an old name for the lime tree.

Latin *tilia* is cognate to Greek πτελέᾱ, *ptelea*, "elm tree", τιλίαι, *tiliai*, "black poplar" (Hes.), ultimately from a Proto-Indo-European word **ptel-e̯i̯ā* with a meaning of "broad" (feminine); perhaps "broad-leaved" or similar.*[4]

34.2 Description

The *Tilia* 's sturdy trunk stands like a pillar and the branches divide and subdivide into numerous ramifications on which the twigs are fine and thick. In summer, these are profusely clothed with large leaves and the result is a dense head of abundant foliage.*[5]

The leaves of all the *Tilia* species are heart-shaped and most are asymmetrical, and the tiny fruit, looking like peas, always hang attached to a ribbon-like, greenish-yellow bract, whose use seems to be to launch the ripened seed-clusters just a little beyond the parent tree. The flowers of the European and American *Tilia* species are similar, except the American bears a petal-like scale among its stamens and the European varieties are devoid of these appendages. All of the *Tilia* species may be propagated by cuttings and grafting, as well as by seed. They grow rapidly in rich soil, but

Lime nail galls, caused by the mite Eriophyes tiliae

are subject to the attack of many insects. *Tilia* is notoriously difficult to propagate from seed unless collected fresh in the fall. If allowed to dry, the seeds will go into a deep dormancy and take 18 months to germinate.[*] [5]

In particular, aphids are attracted by the rich supply of sap, and are in turn often "farmed" by ants for the production of the sap which the ants collect for their own use, and the result can often be a dripping of excess sap onto the lower branches and leaves, and anything else below. Cars left under the trees can quickly become coated with a film of the syrup ("honeydew") thus dropped from higher up. The ant/aphid "farming" process does not appear to cause any

Leaves and trunk

serious damage to the trees.

- Leaf of common lime (*Tilia* × *europaea*) showing venation
- *Tilia* flowers
- *Tilia* fruit
- The venation within a *Tilia* bract

34.3 History

For cultural significance, see Lime tree in culture.

In Europe, some linden trees reached considerable ages. A coppice of *T. cordata* in Westonbirt Arboretum in Gloucestershire is estimated to be 2,000 years old. In the courtyard of the Imperial Castle at Nuremberg is a *Tilia* which, by tradition recounted in 1900, was planted by the Empress Cunigunde, the wife of Henry II of Germany circa 1000. The *Tilia* of Neuenstadt am Kocher in Baden-Württemberg, Germany, was estimated at 1000 years old when it fell.*[5] The Alte Linde tree of Naters, Switzerland, is mentioned in a document in 1357 and described by the writer at that time as already *magnam* (huge). A plaque at its foot mentions that in 1155 a linden tree was already on this spot. The Najevnik linden tree (Slovene: *Najevska lipa*), a 700 years old *Tilia cordata*, is the thickest tree in Slovenia.*[6]

- The excellence of the honey of far-famed Hyblaean Mountains*[7] was due to the linden trees that covered its sides and crowned its summit.
- Lime fossils have been found in the Tertiary formations of Grinnell Land, Canada, at 82° N latitude, and in Svalbard, Norway. Sapporta believed he had found there the common ancestor of the *Tilia* species of Europe and America.*[5]

Tilia johnsoniT. johnsoni *leaf fossil, 49 Ma, Washington, USA*

34.4 Uses

The linden is recommended as an ornamental tree when a mass of foliage or a deep shade is desired.*[5] The tree produces fragrant and nectar-producing flowers, the medicinal herb lime blossom. They are very important honey plants for beekeepers, producing a very pale but richly flavoured monofloral honey. The flowers are also used for herbal teas and tinctures; this kind of use is particularly popular in Europe and also used in North American herbal medicine practices.

34.4.1 Wood

Linden trees produce soft and easily worked timber, which has very little grain and a density of 560 kg per cubic metre.*[8] During the Viking era it was often used for constructing shields. It is a popular wood for model building and for intricate carving. Especially in Germany, it was the classic wood for sculpture from the Middle Ages onwards

Limewood Saint George by Tilman Riemenschneider, circa *1490*

and is the material for the elaborate altarpieces of Veit Stoss, Tilman Riemenschneider, and many others. In England, it was the favoured medium of the sculptor Grinling Gibbons* [9] (1648-1721). The wood is used in marionette- and puppet-making and -carving. Having a fine light grain and being comparatively light in weight, it has been used for centuries for this purpose; despite the availability of modern alternatives it remains one of the main materials used as of 2015.

Ease of working and good acoustic properties also make limewood popular for electric guitar and bass bodies and

for wind instruments such as recorders. Percussion manufacturers sometimes use *tilia* as a material for drum shells, both to enhance their sound and their aesthetics.

The aquarium industry uses lime wood as an air diffuser inside protein skimmers. Air pumped through the grain of the wood turns into consistently very fine bubbles (0.5-1.0 mm), difficult to achieve with any other natural or man-made medium. However, the wood decomposes underwater much faster than ceramic air stones and must be replaced more frequently for maximum efficiency.

Limewood is also the material of choice for window blinds and shutters. Real-wood blinds are often made from this lightweight but strong and stable wood, which is well suited to natural and stained finishes.

34.4.2 Bark

Known in the trade as basswood, particularly in North America, its name originates from the inner fibrous bark of the tree, known as *bast*. A strong*[10] fibre is obtained from the tree by peeling off the bark and soaking it in water for a month, after which the inner fibres can be easily separated. Bast obtained from the inside of the bark of the *Tilia* tree has been used by the Ainu people of Japan to weave their traditional clothing, the *attus*. Similar fibres obtained from other plants are also called bast: see Bast fibre.

34.4.3 Herbalism

Most medicinal research has focused on *Tilia cordata*, although other species are also used medicinally and somewhat interchangeably. The dried flowers are mildly sweet and sticky, and the fruit is somewhat sweet and mucilaginous. Limeflower tea has a pleasing taste, due to the aromatic volatile oil found in the flowers. The flowers, leaves, wood, and charcoal (obtained from the wood) are used for medicinal purposes. Active ingredients in the *Tilia* flowers include flavonoids (which act as antioxidants) and volatile oils. The plant also contains tannins that can act as an astringent.*[11]

Linden flowers are used in herbalism for colds, cough, fever, infections, inflammation, high blood pressure, headache (particularly migraine), and as a diuretic (increases urine production), antispasmodic (reduces smooth muscle spasm along the digestive tract), and sedative.*[12] In the traditional Austrian medicine *Tilia sp.* flowers have been used internally as tea for treatment of disorders of the respiratory tract, fever and flu.*[13] New evidence shows that the flowers may be hepatoprotective.*[14] The wood is used for liver and gallbladder disorders and cellulitis (inflammation of the skin and surrounding soft tissue). That wood burned to charcoal is ingested to treat intestinal disorders and used topically to treat edema or infection such as cellulitis or ulcers of the lower leg.*[11]

Usually, the double-flowered species are used to make perfumes. The leaf buds and young leaves are also edible raw. *Tilia* species are used as food plants by the larvae of some Lepidoptera; see List of Lepidoptera that feed on *Tilia*.

34.5 Classification

The following list comprises those most widely accepted as species, hybrids, and cultivars.

34.5.1 Species

- *Tilia americana* L. – Basswood, American Linden
- *Tilia amurensis* – Amur Lime, Amur Linden
- *Tilia argentea* – Silver Lime
- *Tilia caroliniana* – Carolina Basswood
- *Tilia chinensis*
- *Tilia chingiana* Hu & W.C.Cheng
- *Tilia cordata* Mill. – Small-leaved Lime, Little-leaf Linden or Greenspire Linden

Bole of an ancient Tilia *at Frankenbrunn, Bavaria*

- *Tilia dasystyla* Steven
- *Tilia henryana* Szyszyl. – Henry's Lime, Henry's Linden
- *Tilia heterophylla* Vent. – White Basswood
- *Tilia hupehensis* – Hubei Lime
- *Tilia insularis*

Ancient lime tree

- *Tilia intonsa*
- *Tilia japonica* – Japanese Lime, Shina (When used as a laminate)
- †*Tilia johnsoni* Wolfe & Wehr Eocene; Washington and British Columbia
- *Tilia kiusiana*
- *Tilia mandshurica* – Manchurian Lime
- *Tilia maximowicziana*
- *Tilia mexicana* (*T. americana* var. *mexicana*)
- *Tilia miqueliana*
- *Tilia mongolica* Maxim. –Mongolian Lime, Mongolian Linden
- *Tilia nasczokinii* – Nasczokin's Lime, Nasczokin's Linden
- *Tilia nobilis*
- *Tilia occidentalis* – West lime
- *Tilia oliveri* – Oliver's Lime
- *Tilia paucicostata*
- *Tilia platyphyllos* Scop. – Large-leaved Lime
- *Tilia rubra* – Red Stem Lime (syn. *T. platyphyllos* var. *rubra*)
- *Tilia tomentosa* Moench – Silver Lime, Silver Linden
- *Tilia tuan*

Avenue of lime trees at Turville Heath

34.5.2 Hybrids and cultivars

- *Tilia* × *euchlora* (*T. dasystyla* × *T. cordata*)
- *Tilia* × *europaea* – Common Lime (*T. cordata* × *T. platyphyllos*; syn. *T.* × *vulgaris*)
- *Tilia* × *petiolaris* (*T. tomentosa* × *T. ?*)
- *Tilia* 'Flavescens' – Glenleven Linden (*T. americana* × *T. cordata*)
- *Tilia* 'Moltkei' (hybrid, unknown origin)
- *Tilia* 'Orbicularis' (hybrid, unknown origin)
- *Tilia* 'Spectabilis' (hybrid, unknown origin)

34.6 Gallery

- *Tilia americana*
- *Tilia cordata*
- *Tilia henryana*
- *Tilia heterophylla* (syn. *T. monticola*)
- *Tilia insularis*
- *Tilia japonica*
- *Tilia maximowicziana*

15 year old lime-tree, Haute-Savoie, France

- *Tilia miqueliana*
- *Tilia mongolica*
- *Tilia oliveri*
- *Tilia platyphyllos*
- *Tilia tomentosa*

34.7 See also

- International World War Peace Tree, a *Tilia* tree that stands as a sign of Germany's alliance with the United States
- St Lawrence Lime, a former lime tree in Canterbury, England
- Lime tree in culture

34.8 References

[1] Brown, Lesley (ed.). 2002. *Shorter Oxford English Dictionary*, vol. 1, A–M. 5th ed. Oxford: Oxford University Press, p. 1600.

[2] *Merriam-Webster's Unabridged Dictionary*. 2000. Electronic version 2.5. Springfield, MA: Merriam-Webster, Incorporated.

[3] OED

[4] IEW

[5] Keeler, Harriet L. (1900). *Our Native Trees and How to Identify Them*. New York: Charles Scriber's Sons. pp. 24–31.

[6] Šmid Hribar, Mateja. "Najevska lipa" [Najevnik Linden Tree]. In Šmid Hribar, Mateja; Golež, Gregor; Podjed, Dan; Kladnik, Drago; Erhartič, Bojan; Pavlin, Primož; Ines, Jerele. *Enciklopedija naravne in kulturne dediščine na Slovenskem – DEDI [Encyclopedia of Natural and Cultural Heritage in Slovenia]* (in Slovenian). Retrieved 28 August 2013.

[7] "Honey". *9th Edition of Encyclopedia Britannica*. Retrieved November 22, 2011. ⋯honey most esteemed by the ancients was that of Mount Hybla in Sicily⋯

[8] Lime timber. Niche Timbers. Accessed 19-08-2009.

[9] "Hampton Court Palace: Grinling Gibbons". Hrp.org.uk. Retrieved 2012-07-06.

[10] Kallio, Edwin; Richard M. Godman (1973). *American Basswood... an American Wood*. US Forest Service. p. 5.

[11] Bradley P., ed. (1992). British Herbal Compendium. Vol. 1: 142–144. British Herbal Medicine Association, Dorset (Great Britain)

[12] Coleta, M; Campos, M. G.; Cotrim, M. D.; Proença Da Cunha, A (2001). "Comparative evaluation of Melissa officinalis L., Tilia europaea L., Passiflora edulis Sims. And Hypericum perforatum L. In the elevated plus maze anxiety test". *Pharmacopsychiatry*. 34 Suppl 1: S20–1. PMID 11518069.

[13] Vogl, Sylvia; Picker, Paolo; Mihaly-Bison, Judit; Fakhrudin, Nanang; Atanasov, Atanas G.; Heiss, Elke H.; Wawrosch, Christoph; Reznicek, Gottfried; Dirsch, Verena M.; Saukel, Johannes; Kopp, Brigitte (2013). "Ethnopharmacological in vitro studies on Austria's folk medicine—An unexplored lore in vitro anti-inflammatory activities of 71 Austrian traditional herbal drugs". *Journal of Ethnopharmacology* **149** (3): 750. doi:10.1016/j.jep.2013.06.007. PMID 23770053.

[14] Matsuda, Hisashi; Ninomiya, Kiyofumi; Shimoda, Hiroshi; Yoshikawa, Masayuki (2002). "Hepatoprotective principles from the flowers of Tilia argentea (Linden): Structure requirements of tiliroside and mechanisms of action". *Bioorganic & Medicinal Chemistry* **10** (3): 707. doi:10.1016/S0968-0896(01)00321-2.

34.9 External links

- Eichhorn, Markus (January 2012). "Lime Trees and Bees". *Test Tube*. Brady Haran for the University of Nottingham.

Chapter 35

Tilia cordata

Lime winter. Kyiv, str. Moscow

Tilia cordata (**Small-leaved Lime**, occasionally **Small-leaved Linden** or **Little-leaf Linden**) is a species of *Tilia* native to much of Europe from Britain, through central Scandinavia, to central Russia, and south to central Spain, Italy, Greece, Bulgaria, Romania, Turkey, the Caucasus, and western Asia. In the south of its range it is restricted to high altitudes.*[2]*[3]

35.1 Description

T. cordata is a deciduous tree growing to 20–40 m (60-80') tall, diameter 1/3 to 1/2 the height, with a trunk up to 1 m diameter. The bark is smooth and grayish when young, firm with vertical ridges and horizontal fissures when older. The crown is rounded in a formal oval shape to pyramidal. Branching is upright and increases in density with age.*[4]

The leaves are alternately arranged, rounded to triangular-ovate, 3–8 cm long and broad, mostly hairless (unlike the related *Tilia platyphyllos*) except for small tufts of brown hair in the leaf vein axils - the leaves are distinctively heart-shaped. The buds are alternate, pointed egg shaped and have red scales. It has no terminal bud.*[4] The small yellow-green hermaphrodite flowers are produced in clusters of five to eleven in early summer with a leafy yellow-green subtending bract, have a rich, heavy scent; the trees are much visited by bees. The fruit is a dry nut-like drupe 6–7 mm long by 4 mm broad (infertile fruits are globose), downy at first becoming smooth at maturity, and (unlike *T. platyphyllos*) not ribbed.*[2]*[5]

35.2 Ecology

In Britain, *T. cordata* is considered an indicator of ancient woodland, and is becoming increasingly rare.*[6] Owing to its rarity, a number of woods have been given SSSI status. Cocklode Wood, part of the Bardney Limewoods, is the best surviving spread of medieval small leaved limes in England.*[7] Another site is Shrawley Wood in Worcestershire.*[8] Small leaved lime was once regarded as holy and good for carving.*[9] Tilia cordata is a genus in the family Tiliaceae. Tilia Cordata sprout strongly after cut, sprouts can develop from both cut and fallen stems in age over 200 years. Branches touching the ground may become rooted producing vertical shoots. Sprouts can develop from dormant buds located in the root collar of parent tree with root suckers found up to 5 meters away from the parent tree.*[10]

Trees in northern Britain were found to have established when the climate was warmer and have adapted to the cooling climate. The trees were estimated to have germinated between 1150-1300 AD, making them around 800 years old. Precise age determination is impossible as heartwood at the centre disintegrates and therefore rings cannot be counted, and other methods are used.*[11]

35.3 Pests and diseases

The tree is fairly disease resistant, though a common problem is leaf scorch where planted on dry soils, however leaf scorch is not a long term problem as the leaves are lost in the autumn. Pests include Japanese beetles, aphids, lace bugs and various species of moths.*[12]

35.4 Cultivation and uses

Tilia cordata is widely grown as an ornamental tree. It was much planted to form avenues in 17th and early 18th century landscape planning. A famous example is Unter den Linden in Berlin. It is also widely cultivated in North America as a substitute for the native *Tilia americana* (American linden or basswood) which has a larger leaf, coarser in texture; there it has been renamed "Little-leaf Linden". It is popular as both a shade tree with its dense canopy, an ornamental tree with its architectural shape and a street tree. In the USA, *Tilia cordata* has been planted in Wellesley, MA; Modesto, CA; Chicago, IL; Indianapolis, IN; and Atlanta, GA as street trees.*[13] In Europe, there are espaliered trees owing to the ability to survive heavy pruning. *Tilia cordata* is an easy tree to train for bonsai when the training is not done all at once. Letting the tree recoup in between sessions over a period of several months creates a healthy, good looking miniature tree.*[14]

T. cordata survives best in a soil pH range of 5.0 to 8.0.*[15] USDA Hardiness Zone 3-7.*[16] The tree prefers moist, well drained soil, but can survive flooding; it is not highly drought tolerant.*[12] It does not do well in soils with high salinity.*[17]

35.4.1 Notable trees

The Najevnik linden tree (Slovene: *Najevska lipa*), about 700 years old *Tilia cordata*, is the thickest tree in Slovenia. It is a place of cultural events, and every June a national meeting of Slovene politicians takes place under it.*[18]

35.4.2 Hybrids

- Common Lime: *T. cordata* readily hybridises with *Tilia platyphyllos*; the hybrid is commonly known as Common Lime, *Tilia* × *europaea* (syn. *T.* × *vulgaris*).*[2]*[19]

15 year old lime-tree, Haute-Savoie, France

35.4.3 Cultivars

- 'Corinthian' ('Corzam')- dense, uniform limb spacing creates a compact, pyramidal, formal shape;darker and smaller leaves; resistant to Japanese beetles.*[16]
- 'Greenspire' - the most common, a cross between the cultivar 'Euclid' and a selection from the Boston Parks, broadly used as a street tree, survives better under difficult conditions, overall a good looking, quick growing

tree.*[16]

- 'June Bride'- significantly pyramidal habit, evenly spaced branches around a very straight central leader, glossier leaves, and 3 to 4 times as many flowers.*[16]

- 'Winter Orange' - rich red-orange-brown stems with reddish buds, can be cut back to grow long shoot extensions. An extraordinarily colored cultivar.

35.4.4 Linden flower tea

Mature fruits

Tiliae flos*: Flowers (and impurities consisting of other parts) of the Small-leaved Lime as commonly used in linden flower tea*

In the countries of Central and Western Europe, linden flowers are a traditional herbal remedy made into an herbal tea called 'Tilleul'*[20] (linden flower tea), considered to be of value as an anti-inflammatory in a range of respiratory problems: colds, fever, flu, sore throat, bronchitis, and cough.*[21] The tea is also good for aiding indigestion, calming hysteria fits, vomiting, and palpitations.*[20]

35.4.5 Honey

A monofloral honey is produced by bees using the trees and is considered highly valuable. The young leaves can be eaten as a salad vegetable.*[22] Often cattle graze upon them.*[20]

35.4.6 Linden wood

The white, finely-grained wood is not a structurally strong material but a classic choice for refined woodcarvings such as those by Grinling Gibbons for medieval altars. Linden wood was the prime choice for the carvings in St. Paul's Cathedral, Windsor Castle, and Chatsworth.*[20] It is also commonly used for lightweight projects such as carved spoons, light furniture, bee hives and honeycomb frames.*[23]

35.5 Cultural Significance

Tilia cordata is the national tree of the Czech Republic and the Slovak Republic.*[24]

35.6 References

[1] http://www.arborday.org/trees/treeGuide/browseTrees.cfm

[2] Rushforth, K. (1999). *Trees of Britain and Europe*. Collins ISBN 0-00-220013-9.

[3] Den Virtuella Floran: *Tilia cordata* (in Swedish; with maps

[4] Upham Smith, Alica (1969). *Trees in a winter landscape*. New York: Holt, Rinehart and Winston. ISBN 978-0030818639.

[5] Flora of NW Europe: *Tilia cordata*

[6] Natural England internal website

[7] Woodland Trust *The test-tube tree'' Broadleaf Anon Spring 2014 p7*

[8] Natural England Citation dated 12 May 1986

[9] Woodland Trust Giant seed hunt to revitalize woods'' Broadleaf Anon Spring 2014 p9

[10] Eco section. Retrieved from http://www.valbro.uni-freiburg.de/pdf/paper_tilia.pdf

[11] Pigott, C. D. (May 1989). "Factors Controlling the Distribution of Tilia cordata Mill at the Northern Limits of Its Geographical Range. IV. Estimated Ages of the Trees". *New Phytologist* **112** (1): 117–121. doi:10.1111/j.1469-8137.1989.tb00316.x. Retrieved 25 February 2014.

[12] Gilman, Edward; Watson, Dennis. "Tilia cordata Littleleaf Linden" (PDF). Retrieved 28 February 2014.

[13] Phillips, Leonard E. Jr. (1993). Joel Stein, ed. *Urban Trees: A Guide for Selection, Maintenance, and Master Planning*. United States of America: McGraw-Hill. p. 259.

[14] "Bonsai Focus". Retrieved 27 February 2014.

[15] "Soil pH Trees and Shrubs and what they like" (PDF). Retrieved 22 February 2014.

[16] Dirr, Michael A. (2009). *Manual of Woody Landscape Plants* (6th ed.). Champaign, IL: Stripes. pp. 1148–1149. ISBN 1-58874-868-5.

[17] Kotuby-Amacher, Jan (March 2000). "Salinity and Plant Tolerance" (PDF). Electronic Publishing. pp. 1–8. Retrieved 28 February 2014.

[18] Šmid Hribar, Mateja. "Najevska lipa" [Najevnik Linden Tree]. In Šmid Hribar, Mateja; Golež, Gregor; Podjed, Dan; Kladnik, Drago; Erhartič, Bojan; Pavlin, Primož; Ines, Jerele. *Enciklopedija naravne in kulturne dediščine na Slovenskem – DEDI [Encyclopedia of Natural and Cultural Heritage in Slovenia]* (in Slovenian). Retrieved 28 August 2013.

[19] Flora of NW Europe: *Tilia vulgaris*

[20] Grieve, M. "Lime Tree". Botanical.com.

[21] [Flora Herb & Supplement Encyclopedia http://www.florahealth.com/flora/home/Canada/HealthInformation/Encyclopedias/LindenFlos.htm]

[22] Vernon, J. (2007). Fruits of the forest. *The Garden* November 2007: 738. Royal Horticultural Society.

[23] Williams SWCD (16 February 2005). "Little leaf linden is fragrant". *The Bryan Times*. p. 11. Retrieved 28 February 2014.

[24] *Aberystwyth University campus walks tree directory* (PDF). Aberystwyth University sports centre. p. 9. Retrieved 2011-08-14.

Chapter 36

Tilia platyphyllos

Tilia platyphyllos is a species of flowering plant in the family Malvaceae. It is a deciduous tree, native to much of Europe, including locally in southwestern Great Britain, growing on lime-rich soils. The common name **large-leaved linden** is in standard use throughout the English-speaking world except in the British Isles, where it is widely, but not universally, known as **large-leaved lime**.*[1] The name "lime", possibly a corruption of "line" originally from "lind", has been in use for centuries and also attaches to other species of *Tilia*.*[2] It is not, however, related to the lime fruit tree, a species of citrus.

The specific epithet *platyphyllos* means "with broad leaves".*[3]

36.1 Description

T. platyphyllos is a narrowly domed tree with a moderate growth rate, and can eventually attain a height of 40 m. The reddish-brown young stems later develop dark grey bark with fine fissures and furrows. The branches spread upwards at wide angles. The twigs are reddish-green and slightly pubescent. The foliage consists of simple, alternately arranged leaves. As indicated by its common name, this tree has larger leaves than the related *Tilia cordata* (Small-leaved Linden), 6 to 9 cm (exceptionally 15 cm). They are ovate to cordate, mid to dark green above and below, with white downy hair on the underside, particularly along the veins, tapering into a mucronate tip. The margin is sharply serrate, and the base cordate; the venation is palmate along a midrib. The pubescent petiole is usually 3–4 cm long, but can vary between 1.5–5 cm. The autumn foliage is yellow-green to yellow.

The small, fragrant, yellowish-white flowers are arranged in drooping, cymose clusters in groups of 3 to 4. Their whitish-green, leaf-like bracts have an oblong-obovate shape. The geniculate peduncles are between 1.5–3 cm long. The hermaphroditic flowers have 5 sepals and 5 tepals, numerous stamens, but no staminodes. The superior ovary is 2-10 locular with one smooth style. The flowers are pollinated by bees. The fruit is a small, round, tomentose, cream-colored nutlet with a diameter of 1 cm or less. It has a woody shell with 3-5 ridges.

- leaves
- roots
- vegetative bud starting to open

36.2 Cultivation

T. platyphyllos is widely planted throughout the temperate world as an ornamental tree in parks and city streets. Numerous cultivars are available, including 'Aurea', (golden leafed), 'Fastigiata', 'Laciniata' (seemingly torn leaves), 'Örebro' (columnar), 'Princes Street' (narrow crown), 'Rubra' (red twigged), 'Tortuosa' (twisted branches), and 'Tiltstone Filigree' (upswept branches).*[4]

The cultivar 'Rubra' has gained the Royal Horticultural Society's Award of Garden Merit.*[5]

36.3 Hybrids

Tilia platyphyllos readily hybridises with *Tilia cordata*, the hybrid being the Common Lime *T.* × *europaea* (syn. *T.* × *vulgaris*).

36.4 Medicinal uses

Although *Tilia cordata* is listed as the preferred medicinal species, *T. platyphyllos* is also used medicinally and somewhat interchangeably. The dried flowers are mildly sweet and sticky, and the fruit is somewhat sweet and mucilaginous. Linden tea has a pleasing taste, due to the aromatic volatile oil found in the flowers. The flowers, leaves, wood, and charcoal (obtained from the wood) are used for medicinal purposes. Active ingredients in the linden flowers include flavonoids (which act as antioxidants), volatile oils, and mucilaginous constituents (which soothe and reduce inflammation). The plant also contains tannins that can act as an astringent.*[6]

Linden flowers are used in colds, cough, fever, infections, inflammation, high blood pressure, headache (particularly migraine), as a diuretic (increases urine production), antispasmodic (reduces smooth muscle spasm along the digestive tract), and sedative. The flowers were added to baths to quell hysteria, and steeped as a tea to relieve anxiety-related indigestion, irregular heartbeat, and vomiting. The leaves are used to promote sweating to reduce fevers. The wood is used for liver and gallbladder disorders and cellulitis (inflammation of the skin and surrounding soft tissue). That wood burned to charcoal is ingested to treat intestinal disorders and used topically to treat edema or infection, such as cellulitis or ulcers of the lower leg.*[6]

36.5 Famous trees

- 300-year-old *T. platyphyllos* at Schloss Linderhof Bavaria – known in German as the "Koenigslinde".*[7]
- 700-year-old *T. platyphyllos* at Bojnice Castle, Slovakia – known in Slovak as “Bojnická lipa” (“the Bojnice Linden”) or “Lipa kráľa Mateja” (“King Matej's Linden”).*[8]

36.6 References

[1] *RHS A-Z encyclopedia of garden plants*. United Kingdom: Dorling Kindersley. 2008. p. 1136. ISBN 1405332964.

[2] *Shorter Oxford English dictionary, 6th ed*. United Kingdom: Oxford University Press. 2007. p. 3804. ISBN 0199206872.

[3] Harrison, Lorraine (2012). *RHS Latin for gardeners*. United Kingdom: Mitchell Beazley. p. 224. ISBN 9781845337315.

[4] White, J. & More, D. (2003). *Trees of Britain & Northern Europe*. Cassell's, London. ISBN 0-304-36192-5.

[5] “RHS Plant Selector – *Tilia platyphyllos* 'Rubra'". Retrieved 6 June 2013.

[6] Bradley P, ed. *British Herbal Compendium*. Vol. I. Dorset (Great Britain): British Herbal Medicine Association; 1992: 142–144

[7] McIntosh, Christopher (15 September 2012). *The Swan King: Ludwig II of Bavaria*. I.B.Tauris. p. 193. ISBN 978-1-84885-847-3.

[8] “Large-leaved lime near the castle” . *Monumental trees*. Retrieved 17 February 2014.

Chapter 37

Maple

For other uses, see Maple (disambiguation).

Acer /ˈeɪsər/ is a genus of trees or shrubs commonly known as **maple**. There are approximately 128 species, most of which are native to Asia,*[2] with a number also appearing in Europe, northern Africa, and North America. Only one species, *Acer laurinum*, extends to the Southern Hemisphere.*[3] The type species of the genus is the sycamore maple, *Acer pseudoplatanus*, the most common maple species in Europe.*[4]

37.1 Morphology

Most maples are trees growing to 10–45 m (33–148 ft) height. Others are shrubs less than 10 metres tall with a number of small trunks originating at ground level. Most species are deciduous, and many are renowned for their autumn leaf colour, but a few in southern Asia and the Mediterranean region are evergreen. Most are shade-tolerant when young and are often riparian, understory, or pioneer species rather than climax overstory trees with a few exceptions such as Sugar Maple. Many of the root systems are typically dense and fibrous, inhibiting the growth of other vegetation underneath them. A few species, notably *Acer cappadocicum*, frequently produce root sprouts, which can develop into clonal colonies.*[4]

Maples are distinguished by opposite leaf arrangement. The leaves in most species are palmate veined and lobed, with 3 to 9 (rarely to 13) veins each leading to a lobe, one of which is central or apical. A small number of species differ in having palmate compound, pinnate compound, pinnate veined or unlobed leaves. Several species, including *Acer griseum* (Paperbark maple); *Acer mandshuricum* (Manchurian maple); *Acer maximowiczianum* (Nikko maple); and *Acer triflorum* (Three-flowered maple), have trifoliate leaves. One species, *Acer negundo* (Box-elder), has pinnately compound leaves that may be simply trifoliate or may have five, seven, or rarely nine leaflets. A few, such as *Acer laevigatum* (Nepal maple) and *Acer carpinifolium* (Hornbeam maple), have pinnately veined simple leaves.

The flowers are regular, pentamerous, and borne in racemes, corymbs, or umbels. They have four or five sepals, four or five petals about 1 – 6 mm long (absent in some species), four to ten stamens about 6 – 10 mm long, and two pistils or a pistil with two styles. The ovary is superior and has two carpels, whose wings elongate the flowers, making it easy to tell which flowers are female. Maples flower in late winter or early spring, in most species with or just after the appearance of the leaves, but in some before the trees leaf out.*[5]

Maple flowers are green, yellow, orange or red. Though individually small, the effect of an entire tree in flower can be striking in several species. Some maples are an early spring source of pollen and nectar for bees.

The distinctive fruit are called samaras, "maple keys", "helicopters", "whirlybirds" or "polynoses". These seeds occur in distinctive pairs each containing one seed enclosed in a "nutlet" attached to a flattened wing of fibrous, papery tissue. They are shaped to spin as they fall and to carry the seeds a considerable distance on the wind. People often call them "helicopters" due to the way that they spin as they fall. During World War II, the US Army developed a special air drop supply carrier that could carry up to 65 pounds of supplies and was based on the Maple seed.*[6] Seed maturation is usually in a few weeks to six months after flowering, with seed dispersal shortly after maturity. However, one tree can release hundreds of thousands of seeds at a time. Depending on the species, the seeds can be small and green to orange and big with thicker seed pods. The green seeds are released in pairs, sometimes with the stems still connected. The yellow seeds are released individually and almost always without the stems. Most species

Acer saccharum *(Sugar maple)*

require stratification in order to germinate, and some seeds can remain dormant in the soil for several years before germinating.*[4]

The genus *Acer* together with genus *Dipteronia* are either classified in a family of their own, the *Aceraceae*, or else classified as members of the family *Sapindaceae*. Recent classifications, including the Angiosperm Phylogeny Group system, favour inclusion in *Sapindaceae*. When put in family *Sapindaceae*, genus *Acer* is put in subfamily *Hippocastanoideae*.

Acer circinatum *(Vine maple) leaves showing the palmate veining typical of most species*

The genus is subdivided by its morphology into a multitude of sections and subsections.*[7]

Fifty-four species of maples meet the International Union for Conservation of Nature criteria for being under threat of extinction in their native habitat.*[3]

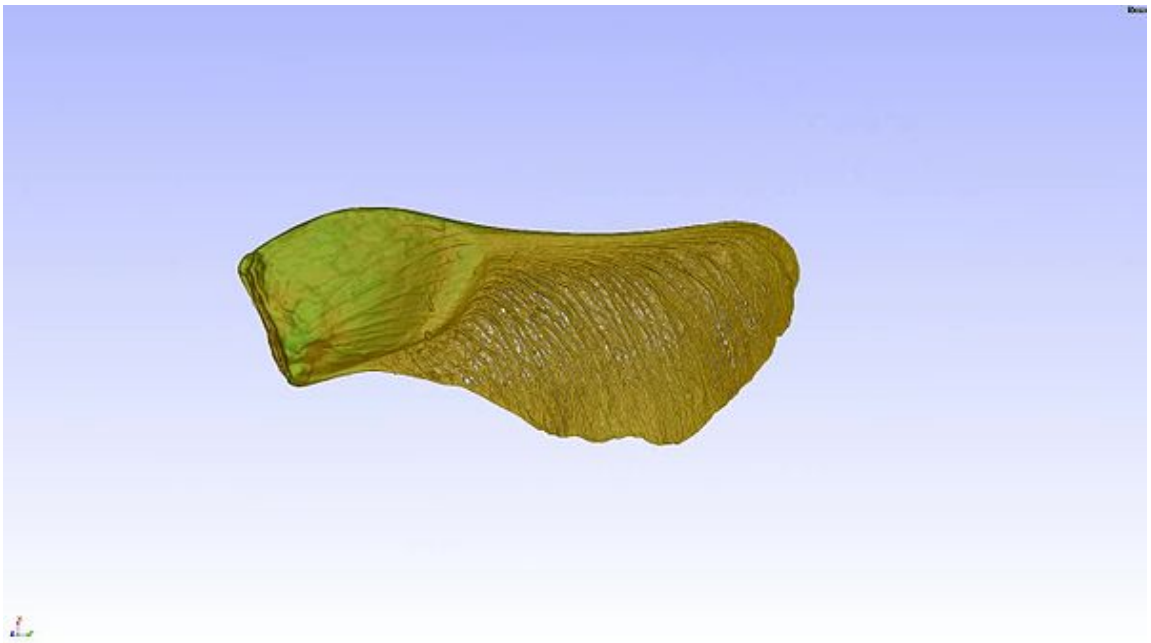
37.2 Pests and diseases

The leaves are used as a food plant for the larvae of a number of the Lepidoptera order (see List of Lepidoptera that feed on maples). Aphids are also very common sap-feeders on maples. In horticultural applications a dimethoate spray will solve this.

In the United States and Canada, all maple species are threatened by the Asian long-horned beetle (*Anoplophora glabripennis*). Infestations have resulted in the destruction of thousands of maples and other tree species in Illinois, Massachusetts, New Jersey and New York.*[8]

Maples are affected by a number of fungal diseases. Several are susceptible to Verticillium wilt caused by *Verticillium* species, which can cause significant local mortality. Sooty bark disease, caused by *Cryptostroma* species, can kill trees that are under stress due to drought. Death of maples can rarely be caused by *Phytophthora* root rot and *Ganoderma* root decay. Maple leaves in late summer and autumn are commonly disfigured by "tar spot" caused by *Rhytisma* species and mildew caused by *Uncinula* species, though these diseases do not usually have an adverse effect on the trees' long-term health.*[9]

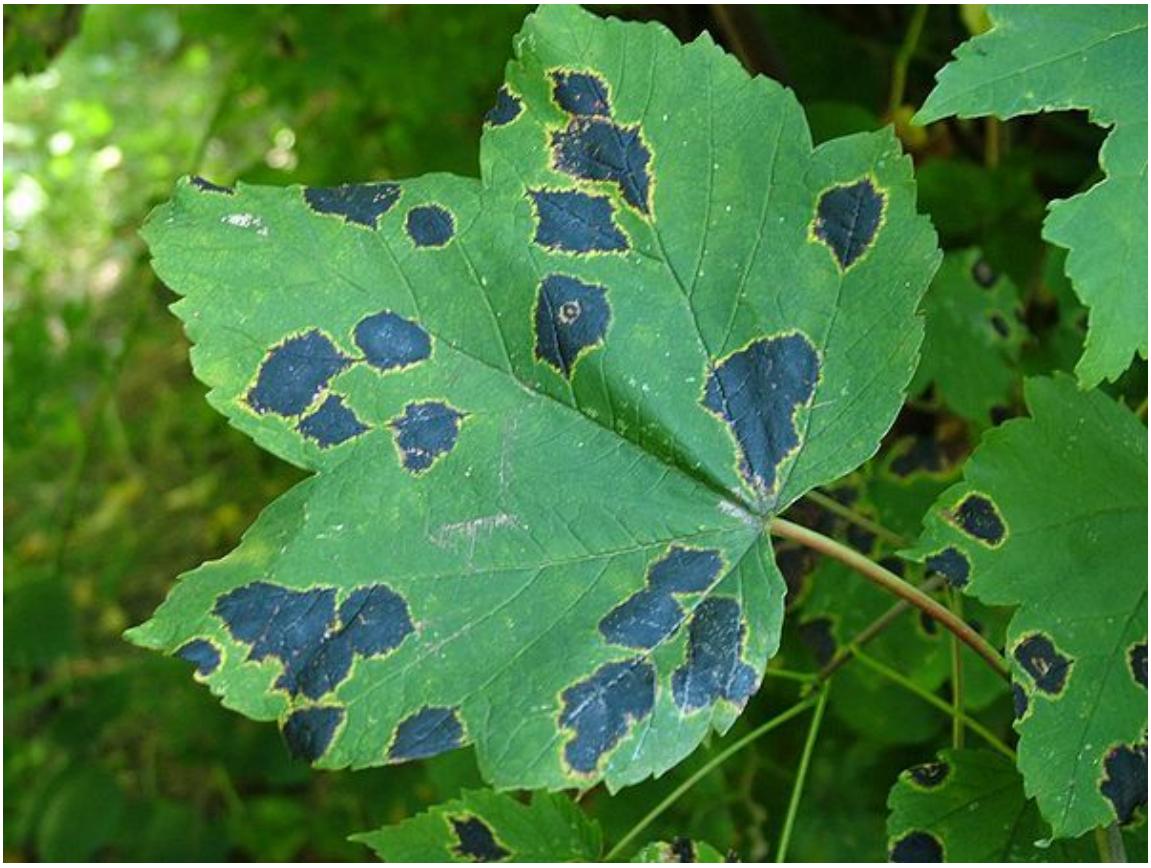
Acer rubrum *(Red maple) flowers*



3D rendering of a µCT scan of a samara. Resolution is about 45 µm/voxel.

37.3 Cultural significance

A maple leaf is on the coat of arms of Canada, and is on the Canadian flag. The maple is a common symbol of strength and endurance and has been chosen as the national tree of many countries including Canada. Maple leaves are traditionally an important part of Canadian Forces military regalia, for example the military rank insignia for



Rhytisma acerinum *fungus on* Acer pseudoplatanus *leaf*

generals use maple leaf symbols.

In the literary world, the word maple was first published in Geoffery Chaucer's "The Knights Tale" on line 2,065, spelled as "mapul".*[10]

37.4 Uses

37.4.1 Horticulture

Some species of maple are extensively planted as ornamental trees by homeowners, businesses and municipalities due to their fall colour, relatively fast growth, ease of transplanting, and lack of hard seeds that would pose a problem for mowing lawns. Particularly popular are Norway Maple (although it is considered invasive in North America), Silver Maple, Japanese Maple, and Red Maple. Other maples, especially smaller or more unusual species, are popular as specimen trees.*[4]

Cultivars

Numerous maple cultivars that have been selected for particular characteristics can be propagated only by asexual reproduction such as cuttings, tissue culture, budding or grafting. *Acer palmatum* (Japanese maple) alone has over 1,000 cultivars, most selected in Japan, and many of them no longer propagated or not in cultivation in the Western world. Some delicate cultivars are usually grown in pots and rarely reach heights of more than 50–100 cm.

The Canadian flag incorporates a stylized maple leaf

Bonsai

Maples are a popular choice for the art of bonsai. Japanese maple (*Acer palmatum*), Trident maple (*A. buergerianum*), Amur maple (*A. ginnala*), Field maple (*A. campestre*) and Montpellier maple (*A. monspessulanum*) are popular choices and respond well to techniques that encourage leaf reduction and ramification, but most species can be used.*[4]*[11]

Collections

Maple collections, sometimes called *aceretums*, occupy space in many gardens and arboreta around the world including the "five great W's" in England: Wakehurst Place Garden, Westonbirt Arboretum, Windsor Great Park, Winkworth Arboretum and Wisley Garden. In the United States, the aceretum at the Harvard-owned Arnold Arboretum in Boston is especially notable. In the number of species and cultivars, the Esveld Aceretum in Boskoop, Netherlands is the largest in the world.*[4]

37.4.2 Tourism

Many maples have bright autumn foliage, and many countries have leaf-watching traditions. In Japan, the custom of viewing the changing colour of maples in the autumn is called "momijigari". Nikko and Kyoto are particularly favoured destinations for this activity. In addition, in Korea, the same viewing activity is called "Danpung-Nori" and the Seoraksan and Naejang-san mountains are very famous places for it.

The *Acer saccharum* (sugar maple) are a contributor to seasonal fall tourism in North America, particularly in Central Ontario, Québec, and the northern tier of the United States including Wisconsin, Michigan, Vermont, New York, New Hampshire and Western Massachusetts.

A red maple tree between pine trees.

37.4.3 Commercial uses

Maples are important as source of syrup and wood. Dried wood is often used for the smoking of food. Charcoal from maples is an integral part of the Lincoln County Process used to make Tennessee Whiskey.* [12] They are also cultivated as ornamental plants and have benefits for tourism and agriculture.

Acer palmatum *(Japanese maple) has over 1,000 cultivars. This cultivar is* A. palmatum *'Sango kaku', sometimes called "coralbark maple".*

Maple syrup

Further information: Maple syrup

The Sugar maple (*A. saccharum*) is tapped for sap, which is then boiled to produce maple syrup or made into maple sugar or maple taffy. It takes about 40 litres (42 US qt) of sugar maple sap to make 1 litre (1.1 US qt) of syrup. While any *Acer* species may be tapped for syrup, many do not have sufficient quantities of sugar to be commercially useful.

Timber

Some of the larger maple species have valuable timber, particularly Sugar maple in North America, and Sycamore maple in Europe. Sugar maple wood —often known as "hard maple" —is the wood of choice for bowling pins, bowling alley lanes, pool cue shafts, and butcher's blocks. Maple wood is also used for the manufacture of wooden baseball bats, though less often than ash or hickory due to the tendency of maple bats to shatter when broken. The maple bat was introduced to Major League Baseball (MLB) in 1998 by Sam Holman of Sam Bats. Today it is the standard maple bat most in use by professional baseball.*[13] Maple is also commonly used in archery as the core material in the limbs of a Recurve Bow due to its stiffness and strength.

Maple wood is often graded based on physical and aesthetic characteristics. The most common terminology includes the grading scale from common #2; which is unselected and often used for craft woods; common #1, used for commercial and residential buildings; clear; and select grade, which is sought for fine woodworking.*[14]

Some maple wood has a highly decorative wood grain, known as flame maple, quilt maple, birdseye maple and burl wood. This condition occurs randomly in individual trees of several species, and often cannot be detected until the wood has been sawn, though it is sometimes visible in the standing tree as a rippled pattern in the bark.

These select decorative wood pieces also have subcategories that further filter the aesthetic looks. Crotch Wood, Bees

Bonsai "*Roter Fächerahorn*"

Wing, Cats Paw, Old Growth and Mottled are some terms used to describe the look of these decorative woods.*[15]

Maples have a long history of use for furniture production in the United States.*[16]

Tonewood

Maple is considered a tonewood, or a wood that carries sound waves well, and is used in numerous musical instruments. Maple is harder and has a brighter sound than Mahogany, which is another major tonewood used in instrument manufacture.*[17]

The back, sides, and neck of most violins, violas, cellos, and double basses are made from maple.

Acer griseum *is widely grown for its decorative bark*

A bench made of highly figured maple wood

Electric guitar necks are commonly made from maple, having good dimensional stability. The necks of the Fender Stratocaster and Telecaster were originally an entirely maple one piece neck, but later were also available with rosewood fingerboards. Les Paul desired an all maple guitar, but due to the weight of maple, only the tops of Gibson's

Les Paul guitars are made from carved maple, often using quilted or flamed maple tops. Due to its weight, very few solid body guitars are made entirely from maple, but many guitars have maple necks, tops or veneers.

Maple is also often used to make bassoons and sometimes for other woodwind instruments like maple recorders.

Many drums are made from maple. From the 70s to the 90s, maple drum kits were a vast majority of all drum kits made, but in recent years, Birch has become popular for drums once again. Some of the best drum-building companies use maple extensively throughout their mid-pro range.*[4] Maple drums are favored for their bright resonant sound.*[18]

Agriculture

As they are a major source of pollen in early spring before many other plants have flowered, maples are important to the survival of honeybees that play a commercially important role later in the spring and summer.

Pulpwood

Maple is used as pulpwood. The fibers have relatively thick walls that prevents collapsing upon drying. This gives good bulk and opacity in paper. Maple also gives paper with good printing properties.

37.5 Notes

[1] Stevens, P. F. (2001 onwards). Angiosperm Phylogeny Website. Version 9, June 2008 [and more or less continuously updated since]. http://www.mobot.org/MOBOT/research/APweb/.

[2] Tingzhi Xu, Yousheng Chen, Piet C. de Jong, Herman John Oterdoom & Chin-Sung Chang. "*Acer* Linnaeus" . *Flora of China*. Missouri Botanical Garden, St. Louis, MO & Harvard University Herbaria, Cambridge, MA. Retrieved 27 May 2012.

[3] Gibbs, D. & Chen, Y. (2009) The Red List of Maples Botanic Gardens Conservation International (BGCI) ISBN 978-1-905164-31-8

[4] van Gelderen, C. J. & van Gelderen, D. M. (1999). *Maples for Gardens: A Color Encyclopedia*

[5] Huxley, A., ed. (1992). *New RHS Dictionary of Gardening*. Macmillan ISBN 0-333-47494-5.

[6] "Sky Hook Spirals from Plane" *Popular Mechanics*, December 1944, p. 75.

[7] Classification of maples

[8] http://www.beetlebusters.info/; http://www.umassgreeninfo.org/fact_sheets/wood_attackers/asian_longhorned_beetle_MA.html#226

[9] Phillips, D. H. & Burdekin, D. A. (1992). *Diseases of Forest and Ornamental Trees*. Macmillan. ISBN 0-333-49493-8.

[10] Simpson, J. A., and E. S. C. Weiner. The Oxford English dictionary. 2nd ed. Oxford: Clarendon Press ;, 1989. Print.

[11] D'Cruz, Mark. "Ma-Ke Bonsai Care Guide for *Acer buergerianum*". Ma-Ke Bonsai. Retrieved 2011-07-05.

[12] Zandona, Eric. "Tennessee Whiskey Gets a Legal Definition" . *EZdrinking*. Retrieved 2014-01-11.

[13] Sam Holman Maple Baseball Bats

[14] The Illustrated Grading Guide to American Hardwoods

[15] Wood Terms and Examples

[16] Joseph Aronson (1965). *The encyclopedia of furniture*. Random House, Inc. pp. 300–. ISBN 978-0-517-03735-5. Retrieved 8 September 2010.

[17] http://www.fender.com/en-GB/news/index.php/?display_article=395

[18] Geoff Nicholls; Tony Bacon (1 June 1997). *The drum book*. Hal Leonard Corporation. pp. 54–. ISBN 978-0-87930-476-8. Retrieved 19 October 2010.

37.5.1 Gallery

- *Acer cappadocicum* (Cappadocian maple)
- *Acer carpinifolium* leaves
- *Acer freemanii* 'Autumn Blaze' (a cross between *Acer rubrum* and *Acer saccharinum*
- *Acer macrophyllum* flowers and young leaves
- *Acer laevigatum* leaves and fruit
- *Acer sempervirens* foliage
- *Acer ginnala* foliage
- *Acer palmatum* trees and bamboo in Japan
- *Acer grandidentatum* (Bigtooth Maple) in autumn colour
- *Acer platanoides* leaf
- *Acer palmatum* leaf in autumn
- *Acer platanoides* (Norway maple) samaras
- *Acer griseum* (Paperbark maple)

37.6 See also

- List of Acer species
- Mazer – a drinking vessel made from maple wood
- List of foods made from maple

37.7 References

37.7.1 Bibliography

- Philips, Roger (1979). *Trees of North America and Europe*. New York: Random House, Inc. ISBN 0-394-50259-0.

37.8 External links

- Eichhorn, Markus (November 2011). "The Maple Tree". *Test Tube*. Brady Haran for the University of Nottingham.
- http://www.vicfirth.com/products/americanheritage.php

Chapter 38

Acer campestre

Acer campestre, common name **field maple**,[*][2] is a maple native to much of Europe, north to southern Scotland (where it is the only native maple), Denmark, Poland and Belarus, and also southwest Asia from Turkey to the Caucasus, and north Africa in the Atlas Mountains.[*][3][*][4][*][5][*][6][*][7][*][8][*][9] In North America it is known as **hedge maple**[*][10][*][11] and in Australia, it is sometimes called **common maple.**[*][12]

38.1 Description

It is a deciduous tree reaching 15–25 metres (49–82 ft) tall, with a trunk up to 1 metre (3 ft 3 in) in diameter, with finely fissured, often somewhat corky bark. The shoots are brown, with dark brown winter buds. The leaves are in opposite pairs, 5–16 centimetres (2.0–6.3 in) long (including the 3–9 centimetres (1.2–3.5 in) petiole) and 5–10 centimetres (2.0–3.9 in) broad, with five blunt, rounded lobes with a smooth margin. Usually monoecious, the flowers are produced in spring at the same time as the leaves open, yellow-green, in erect clusters 4–6 centimetres (1.6–2.4 in) across, and are insect-pollinated. The fruit is a samara with two winged achenes aligned at 180°, each achene is 8–10 millimetres (0.31–0.39 in) wide, flat, with a 2 centimetres (0.79 in) wing.[*][6][*][7]

The two varieties, not accepted as distinct by all authorities, are:[*][4][*][6]

- *A. campestre* var. *campestre* - downy fruit
- *A. campestre* var. *leiocarpum* (Opiz) Wallr. (syn. *A. campestre* subsp. *leiocarpum*) - hairless fruit

The closely related *Acer miyabei* replaces it in eastern Asia.[*][6]

- Field maple flowers
- Field maple in autumn, France
- Field maple, Germany
- Leaves and inflorescence
- Leaves and fruits

38.2 Ecology

Field maple is an intermediate species in the ecological succession of disturbed areas; it typically is not among the first trees to colonise a freshly disturbed area, but instead seeds in under the existing vegetation. It is very shade-tolerant during the initial stages of its life, but it has higher light requirements during its seed-bearing years. It exhibits rapid growth initially, but is eventually overtaken and replaced by other trees as the forest matures. It is most commonly found on neutral to alkaline soils, but more rarely on acidic soil.[*][9]

Maple field tree, Weinsberg

Diseases include a leaf spot fungus *Didymosporina aceris*, a mildew *Uncinula bicornis*, a canker *Nectria galligena*, and verticillium wilt *Verticillium alboatrum*. The leaves are also sometimes damaged by gall mites in the genus *Aceria*, and the aphid *Periphyllus villosus*.*[13]

38.3 Cultivation

The field maple is widely grown as an ornamental tree in parks and large gardens. The wood is white, hard and strong, and used for furniture, flooring, wood turning and musical instruments,*[14] though the small size of the tree and its relatively slow growth make it an unimportant wood.*[6]

It is locally naturalised in parts of the United States*[10] and more rarely in New Zealand.*[15] The hybrid maple *Acer* × *zoeschense* has *A. campestre* as one of its parents.*[7]

The tree has gained the Royal Horticultural Society's Award of Garden Merit.*[16]

38.3.1 Cultivars

Over 30 cultivars of *Acer campestre* are known, selected for their foliage or habit, or occasionally both; several have been lost to cultivation.*[17]

38.4 Bonsai

A. campestre (and the similar *A. monspessulanum*) are popular among *bonsai* enthusiasts. The dwarf cultivar 'Microphyllum' is especially useful in this regard. *A. campestre bonsai* have an appearance distinct from those selected from some other maples such as *A. palmatum* with more frilly, translucent, leaves. The shrubby habit and smallish leaves of *A. campestre* respond well to techniques encouraging ramification and leaf reduction.*[18]*[19]

- Field maple leaf

- Leaves and flowers
- Field maple, Germany
- Leaves
- Foliage in spring
- Field maple leaf
- Field maple, Hesse, Germany
- Field maple leaf
- Acer campestre
- Field maple

38.5 References

[1] Stevens, P. F. (2001 onwards). Angiosperm Phylogeny Website Version 9, June 2008 [and more or less continuously updated since].

[2] L., Leinemann; Bendixen, Kathrin (1999). "Inheritance of isozyme variants in field maple (Acer campestre L.)". *Forest Genetics 6*: 73–77.

[3] "*Acer campestre*". Flora Europaea. Retrieved August 29, 2007.

[4] Euro+Med Plantbase Project: *Acer campestre*

[5] Flora of NW Europe: *Acer campestre*

[6] Rushforth, K. (1999). *Trees of Britain and Europe*. Collins ISBN 0-00-220013-9.

[7] Mitchell, A. F. (1974). *A Field Guide to the Trees of Britain and Northern Europe*. Collins ISBN 0-00-212035-6

[8] Den virtuella floran: *Acer campestre* distribution map

[9] Nagy, L. & Ducci, F. (2004). *EUFORGEN* Technical guidelines for genetic conservation and use. Field maple *Acer campestre*. International Plant Genetic Resources Institute. Rome, Italy. Available online (pdf file).

[10] "*Acer campestre*". USDA Plants Profile. Retrieved August 29, 2007.

[11] "*Acer campestre*". Ohio State University. Retrieved August 29, 2007.

[12] Department of Agriculture, Western Australia: Pests and Diseases Image Library

[13] Field maple images and diseases

[14] "Field maple_Woodland Trust".

[15] *Trans. and Proc. Roy. Soc. New Zealand* 36: 203-225 Plants naturalised in the County of Ashburton

[16] RHS Plant Selector Acer campestre AGM / RHS Gardening

[17] van Gelderen, C.J. & van Gelderen, D.M. (1999). Maples for Gardens: A Color Encyclopedia.

[18] "*A. campestre*". Bonsai Club International. Retrieved November 26, 2006.

[19] D'Cruz, Mark. "Ma-Ke Bonsai Care Guide for Acer campestre". Ma-Ke Bonsai. Retrieved April 15, 2011.

38.6 Further reading

- Chybicki, Igor J.; Waldon-Rudzionek, Barbara; Meyza, Katarzyna (December 2014). "Population at the edge: increased divergence but not inbreeding towards northern range limit in Acer campestre". *Tree Genetics and Genomes* **10** (6): 1739–1753. doi:10.1007/s11295-014-0793-2.

38.7 External links

Maple field illustration

Leaf

Chapter 39

Oak

"Quercus" redirects here. For other uses, see Quercus (disambiguation).
"Oak tree" redirects here. For other uses, see Oak Tree (disambiguation).
This article is about oaks (Quercus). For other uses of "Oak", see Oak (disambiguation).

An **oak** is a tree or shrub in the genus ***Quercus*** (/ˈkwɜrkəs/;* [1] Latin "oak tree") of the beech family, Fagaceae. There are approximately 600 extant species of oaks. The common name "oak" may also appear in the names of species in related genera, notably *Lithocarpus*. The genus is native to the Northern Hemisphere, and includes deciduous and evergreen species extending from cool temperate to tropical latitudes in Asia and the Americas. North America contains the largest number of oak species, with approximately 90 occurring in the United States. Mexico has 160 species, of which 109 are endemic. The second greatest center of oak diversity is China, which contains approximately 100 species.* [2]

Oaks have spirally arranged leaves, with lobate margins in many species; some have serrated leaves or entire leaves with smooth margins. Many deciduous species are marcescent, not dropping dead leaves until spring. In spring, a single oak tree produces both male flowers (in the form of catkins) and small female flowers.* [3] The fruit is a nut called an acorn, borne in a cup-like structure known as a cupule; each acorn contains one seed (rarely two or three) and takes 6–18 months to mature, depending on species. The live oaks are distinguished for being evergreen, but are not actually a distinct group and instead are dispersed across the genus.

39.1 Classification

Oak trees are a flowering plant. Oaks may be divided into two genera (sometimes referred to as subgenera) and a number of sections:

39.1.1 Genus *Quercus*

See also: List of Quercus species

The genus *Quercus* is divided into the following sections:

- Sect. *Quercus* (synonyms *Lepidobalanus* and *Leucobalanus*), the white oaks of Europe, Asia and North America. Styles are short; acorns mature in 6 months and taste sweet or slightly bitter; the inside of an acorn shell is hairless. The leaves mostly lack a bristle on their lobe tips, which are usually rounded. The type species is Quercus robur.
- Sect. *Mesobalanus*, Hungarian oak and its relatives of Europe and Asia. Styles long; acorns mature in about 6 months and taste bitter; the inside of this acorn's shell is hairless. The section *Mesobalanus* is closely related to section *Quercus* and sometimes included in it.
- Sect. *Cerris*, the Turkey oak and its relatives of Europe and Asia. Styles long; acorn mature in 18 months and

Oak at Schönderling

taste very bitter. The inside of the acorn's shell is hairless. Its leaves typically have sharp lobe tips, with bristles at the lobe tip.

- Sect. *Protobalanus*, the canyon live oak and its relatives, in southwest United States and northwest Mexico. Styles short, acorns mature in 18 months and taste very bitter. The inside of the acorn shell appears woolly. Leaves typically have sharp lobe tips, with bristles at the lobe tip.
- Sect. *Lobatae* (synonym *Erythrobalanus*), the red oaks of North America, Central America and northern South

America. Styles long; acorns mature in 18 months and taste very bitter. The inside of the acorn shell appears woolly. The actual nut is encased in a thin, clinging, papery skin. Leaves typically have sharp lobe tips, with spiny bristles at the lobe.

39.1.2 Genus *Cyclobalanopsis*

- The ring-cupped oaks of eastern and southeastern Asia. Evergreen trees growing 10–40 m (33–131 ft) tall. They are distinct from subgenus *Quercus* in that they have acorns with distinctive cups bearing concrescent rings of scales; they commonly also have densely clustered acorns, though this does not apply to all of the species. IUCN, ITIS, Encyclopedia of Life and *Flora of China* treats *Cyclobalanopsis* as a distinct genus, but some taxonomists consider it a subgenus of *Quercus*. It contains about 150 species. Species of *Cyclobalanopsis* are common in the evergreen subtropical laurel forests which extend from southern Japan, southern Korea, and Taiwan across southern China and northern Indochina to the eastern Himalayas, in association with trees of genus *Castanopsis* and the laurel family (Lauraceae).

39.2 Hybridization

A hybrid white oak, possibly Quercus stellata × Q. muhlenbergii

Interspecific hybridization is quite common among oaks but usually between species within the same section only and most common in the white oak group (subgenus *Quercus*, section *Quercus*; see **List of *Quercus* species**). Inter-section hybrids, except between species of sections *Quercus* and *Mesobalanus*, are unknown. Recent systematic studies appear to confirm a high tendency of *Quercus* species to hybridize because of a combination of factors. White oaks are unable

to discriminate against pollination by other species in the same section. Because they are wind pollinated and they have weak internal barriers to hybridization, hybridization produces functional seeds and fertile hybrid offspring.*[4] Ecological stresses, especially near habitat margins, can also cause a breakdown of mate recognition as well as a reduction of male function (pollen quantity and quality) in one parent species.*[4]*[5]

Frequent hybridization among oaks has consequences for oak populations around the world; most notably, hybridization has produced large populations of hybrids with copious amounts of introgression, and the evolution of new species.*[6] Frequent hybridization and high levels of introgression have caused different species in the same populations to share up to 50% of their genetic information.*[7] Having high rates of hybridization and introgression produces genetic data that often does not differentiate between two clearly morphologically distinct species, but instead differentiates populations.*[8] Numerous hypotheses have been proposed to explain how oak species are able to remain morphologically and ecologically distinct with such high levels of gene flow, but the phenomenon is still largely a mystery to botanists.

The Fagaceae, or beech family, to which the oaks belong, is a very slow evolving clade compared to other angiosperms,*[9]*[10] and the patterns of hybridization and introgression in *Quercus* pose a great challenge to the concept of a species since a species is often defined as a group of "actually or potentially interbreeding populations which are reproductively isolated from other such groups." *[11] By this definition, many species of *Quercus* would be lumped together according to their geographic and ecological habitat, despite clear distinctions in morphology and, to a large extent, genetic data.

39.3 Uses

Oak wood has a density of about 0.75 g/cm^3 (0.43 oz/cu in) creating great strength and hardness. The wood is very resistant to insect and fungal attack because of its high tannin content. It also has very appealing grain markings, particularly when quartersawn. Oak planking was common on high status Viking longships in the 9th and 10th centuries. The wood was hewn from green logs, by axe and wedge, to produce radial planks, similar to quarter-sawn timber. Wide, quarter-sawn boards of oak have been prized since the Middle Ages for use in interior panelling of prestigious buildings such as the debating chamber of the House of Commons in London and in the construction of fine furniture. Oak wood, from *Quercus robur* and *Quercus petraea*, was used in Europe for the construction of ships, especially naval men of war, until the 19th century, and was the principal timber used in the construction of European timber-framed buildings. Today oak wood is still commonly used for furniture making and flooring, timber frame buildings, and for veneer production. Barrels in which wines, sherry, and spirits such as brandy, Irish whiskey, Scotch whisky and Bourbon whiskey are aged are made from European and American oak. The use of oak in wine can add many different dimensions to wine based on the type and style of the oak. Oak barrels, which may be charred before use, contribute to the colour, taste, and aroma of the contents, imparting a desirable oaky vanillin flavour to these drinks. The great dilemma for wine producers is to choose between French and American oakwoods. French oaks (*Quercus robur*, *Q. petraea*) give the wine greater refinement and are chosen for the best wines since they increase the price compared to those aged in American oak wood. American oak contributes greater texture and resistance to ageing, but produces more powerful wine bouquets. Oak wood chips are used for smoking fish, meat, cheeses,*[12] and other foods.

Japanese oak is used in the making of professional drums from the manufacturer Yamaha Drums. The higher density of oak gives the drum a brighter and louder tone compared to traditional drum materials such as maple and birch. In hill states of India, besides fuelwood and timber, the local people use oak wood for making agricultural implements. The leaves are used as fodder during lean period and bedding for livestock.*[13]*[14]

The bark of the cork oak is used to produce wine stoppers (corks). This species grows in the Mediterranean Sea region, with Portugal, Spain, Algeria, and Morocco producing most of the world's supply.

Of the North American oaks, the northern red oak is the one of most prized of the red oak group for lumber, much of which is marketed as red oak regardless of the species of origin. It is not good for outdoor use due to its open capillaries unless the wood is treated. If the wood is properly treated with preservatives, it will not rot as quickly as cured white oak heartwood. The closed cell structure of white oaks prevent them from absorbing preservatives. With northern red oak, one can blow air through an end grain piece 10 inches long to make bubbles come out in a glass of water. These openings give fungus easy access when the finish deteriorates. Shumard oak, a member of the red oak subgenus, provides timber which is described as "mechanically superior" to Northern Red oak. Cherrybark oak is another type of red oak which provides excellent timber.

The standard for the lumber of the white oak group – all of which is marketed as white oak – is the white oak. White

Heart of oak beams of the frame of Saint-Girons church in Monein, France

oak is often used to make wine barrels. The wood of the deciduous pedunculate oak and sessile oak accounts for most of the European oak production, but evergreen species, such as Holm oak and cork oak also produce valuable timber.

Sherry maturing in oak barrels

The bark of the White Oak is dried and used in medical preparations. Oak bark is also rich in tannin, and is used by tanners for tanning leather. Acorns are used for making flour or roasted for acorn coffee.

Oak galls were used for centuries as a main ingredient in iron gall ink, a kind of manuscript ink, harvested at a specific time of year. In Korea, oak bark is used to make shingles for traditional roof construction.

Oak has been listed as one of the 38 substances used to prepare Bach flower remedies,*[15] a kind of alternative medicine promoted for its effect on health. However according to Cancer Research UK, "there is no scientific evidence to prove that flower remedies can control, cure or prevent any type of disease, including cancer" .*[16]

39.4 Biodiversity and ecology

Oaks are keystone species in a wide range of habitats from Mediterranean semi-desert to subtropical rainforest. For example, oak trees are important components of hardwood forests, and certain species are particularly known to grow in associations with members of the Ericaceae in oak-heath forests.*[17]*[18] A number of kinds of truffles, including the two well known varieties, the black Périgord truffle*[19] and the white Piedmont truffle,*[20] have symbiotic relationships with oak trees. The European pied flycatcher is an example of an animal species that often depends upon oak trees.

Many species of oaks are under threat of extinction in the wild, largely due to land use changes, livestock grazing and unsustainable harvesting. For example, over the past 200 years, large areas of oak forest in the highlands of Mexico, Central America and the northern Andes have been cleared for coffee plantations and cattle ranching. There is a

A cross section of the trunk of a cork oak, Quercus suber

Oak forest in Estonia.

continuing threat to these forests from exploitation for timber, fuelwood and charcoal.*[21] In the USA, entire oak ecosystems have declined due to a combination of factors still imperfectly known, but thought to include fire suppression, increased consumption of acorns by growing mammal populations, herbivory of seedlings, and introduced pests.*[22] In a recent survey, 78 wild oak species have been identified as being in danger of extinction, from a global total of over 500 species.*[23] The proportion under threat may be much higher in reality, as there is insufficient

information about over 300 species, making it near impossible to form any judgement of their status.

In the Himalayan region of India, oak forests are being invaded by pine forests due to the increase in temperature. The associated species of pine forest may cross frontiers and become new elements of the oak forests.*[24]

In eastern North America, rare species of oak trees include scarlet oak (*Quercus coccinea*), chinkapin oak (*Quercus muehlenbergii*), and post oak (*Quercus stellata*).*[25]

39.5 Diseases and pests

See also: List of Lepidoptera that feed on oaks

Sudden oak death (*Phytophthora ramorum*) is a water mould that can kill oaks within just a few weeks. Oak wilt,

Oak powdery mildew on pedunculate oak

caused by the fungus *Ceratocystis fagacearum* (a fungus closely related to Dutch elm disease), is also a lethal disease of some oaks, particularly the red oaks (the white oaks can be infected but generally live longer). Other dangers include wood-boring beetles, as well as root rot in older trees which may not be apparent on the outside, often being discovered only when the trees come down in a strong gale. Oak apples are galls on oaks made by the gall wasp. The female kermes scale causes galls to grow on kermes oak. Oaks are used as food plants by the larvae of Lepidoptera (butterfly and moth) species such as the gypsy moth, *Lymantria dispar*, which can defoliate oak and other broadleaved tree species in North America.*[26]

A considerable number of galls are found on oak leaves, buds, flowers, roots, etc. Examples are oak artichoke gall, oak marble gall, oak apple gall, knopper gall, and spangle gall.

A number of species of fungus cause powdery mildew on oak species. In Europe the species *Erysiphe alphitoides* is the most common cause.*[27]

A new and yet little understood disease of mature oaks, acute oak decline, has been reported in parts of the UK since 2009.*[28]

Oak processionary moth (*Thaumetopoea processionea*) has become a serious threat in the UK since 2006. The

caterpillars of this species defoliate the trees, and are hazardous to human health; their bodies are covered with poisonous hairs which can cause rashes and respiratory problems.*[29]

39.6 Toxicity

The leaves and acorns of the oak tree are poisonous to cattle, horses, sheep, and goats in large amounts due to the toxin tannic acid, and cause kidney damage and gastroenteritis. Additionally, once livestock have a taste for the leaves and acorns, they may seek them out. Symptoms of poisoning include lack of appetite, depression, constipation, diarrhea (which may contain blood), blood in urine, and colic. The exception to livestock and oak toxicity is the domestic pig, which may be fed entirely on acorns in the right conditions, and has traditionally been pastured in oak woodlands (such as the Spanish *dehesa* and the English system of pannage) for hundreds of years.

Acorns are also edible to humans in processed form, after leaching of the tannins.

Acorns are a staple part of the forage consumed by wildlife, including squirrels.

39.7 Cultural significance

Oak branches on the coat of arms of Estonia

39.7.1 National symbol

The oak is a common symbol of strength and endurance and has been chosen as the national tree of many countries. Already an ancient Germanic symbol (in the form of the Donar Oak, for instance), certainly since the early nineteenth century, it stands for the nation of Germany and oak branches are thus displayed on some German coins, both of the former Deutsche Mark and the current Euro currency.*[30] In 2004 the Arbor Day Foundation*[31] held a vote for the official National Tree of the United States of America. In November 2004, the United States Congress passed legislation designating the oak as America's National Tree.*[32]

Other countries have also designated the oak as their national tree including Serbia, Cyprus (Golden Oak), England, Estonia, France, Germany, Moldova, Romania, Jordan, Latvia, Lithuania, Poland, the United States, Wales, Galicia and Bulgaria.*[33]

Oaks as regional and state symbols

The oak is the emblem of County Londonderry in Northern Ireland, as a vast amount of the county was covered in forests of the tree until relatively recently. The name of the county comes from the city of Derry, which originally in Irish was known as *Doire* meaning *oak*.

The Irish County Kildare derives its name from the town of Kildare which originally in Irish was *Cill Dara* meaning the Church of the Oak or Oak Church.

Iowa designated the oak as its official state tree in 1961; and the White Oak is the state tree of Connecticut, Illinois and Maryland. The Northern Red Oak is the provincial tree of Prince Edward Island, as well as the state tree of New Jersey. The Live Oak is the state tree of Georgia, USA.

The oak is a national symbol from the Basque Country, specially in the province of Biscay.

The coat-of-arms of Vest-Agder, Norway, features an oak tree.

Oak leaves are traditionally an important part of German Army regalia. The Nazi party used the traditional German eagle, standing atop of a swastika inside a wreath of oak leaves. It is also known as the Iron Eagle. During the Third Reich of Nazi Germany, oak leaves were used for military valor decoration on the Knights Cross of the Iron Cross. They also symbolize rank in the United States Armed Forces. A gold oak leaf indicates an O-4 (Major or Lt. Commander), whereas a silver oak leaf indicates an O-5 (Lt. Colonel or Commander).*[34] Arrangements of oak leaves, acorns and sprigs indicate different branches of the United States Navy Staff corps officers.*[34] Oak leaves are embroidered onto the covers (hats) worn by field grade officers and flag officers in the United States armed services.

If a member of the United States Army or Air Force earns multiple awards of the same medal, then instead of wearing a ribbon or medal for each award, he or she wears one metal representation of an "oak leaf cluster" attached to the appropriate ribbon for each subsequent award.

Political use

The oak tree is used as a symbol by a number of political parties. It is the symbol of Toryism (on account of the Royal Oak) and the Conservative Party in the United Kingdom,*[35] and formerly of the Progressive Democrats in Ireland*[36] and the Democrats of the Left in Italy. In the cultural arena, the oakleaf is the symbol of the National Trust (UK), The Woodland Trust, and The Royal Oak Foundation.*[34]

39.7.2 Religious

In Greek mythology, the oak is the tree sacred to Zeus, king of the gods. In Zeus's oracle in Dodona, Epirus, the sacred oak was the centerpiece of the precinct, and the priests would divine the pronouncements of the god by interpreting the rustling of the oak's leaves.*[37]

In Baltic mythology, the oak is the sacred tree of Latvian Pērkons, Lithuanian Perkūnas and Prussian Perkūns. Pērkons is the god of thunder and one of the most important deities in the Baltic pantheon.

In Celtic polytheism, the name of the oak tree was part of the Proto-Celtic word for 'druid': **derwo-weyd-* > **druwid-* ; however, Proto-Celtic **derwo-* (and **dru-*) can also be adjectives for 'strong' and 'firm', so Ranko Matasovic interprets

that **druwid-* may mean 'strong knowledge'. As in other Indo-European faiths, Taranus, being a Thunder God, was associated with the oak tree.*[38] The Indo-Europeans worshiped the oak and connected it with a thunder or lightning god; "tree" and *drus* may also be cognate with "Druid," the Celtic priest to whom the oak was sacred. There has even been a study that shows that oaks are more likely to be struck by lightning than any other tree of the same height.*[39]

In Norse mythology, the oak was sacred to the thunder god, Thor. Thor's Oak was a sacred tree of the Germanic Chatti tribe. According to legend, the Christianisation of the heathen tribes by Saint Boniface was marked by the oak's being replaced by the fir (whose triangular shape symbolizes the Trinity) as a "sacred" tree.*[40]

> Thrice on my bossy shield I struck my spear;
>
> And thrice a ghost's shrill voice was heard in air;
>
> The sacred oaks that skirt this sloping wood
>
> Are dead--revive their withered roots with blood;
>
> The blood of foes shall fertilze the plain,
>
> and Odin's spirt feast on heaps of slain.
>
> Hark! now I hear his mighty voice from far--
>
> Rise, sons of Odin, and prepare for war*[41]

In the Bible, the oak tree at Shechem is the site where Jacob buries the foreign gods of his people (Gen. 35:4) . In addition, Joshua erects a stone under an oak tree as the first covenant of the Lord (Josh. 24.25–7). In Isaiah 61, the prophet refers to the Israelites as "Oaks of Righteousness" .

The badnjak is central tradition in Serbian Orthodox Church Christmas celebration where young and straight oak, is ceremonially felled early on the morning of Christmas Eve.

In Slavic mythology, the oak was the most important tree of the god Perun.

39.7.3 Historical

Several singular oak trees, such as the Royal Oak in Britain and the Charter Oak in the United States, are of great historical or cultural importance; for a list of important oaks, see Individual oak trees.

"The Proscribed Royalist, 1651", a famous painting by John Everett Millais, depicted a Royalist fleeing from Cromwell's forces and hidden in an oak. Millais painted the picture in Hayes, Kent, from a local oak tree that became known as the Millais Oak.*[42]*[43]

Approximately 50 km west of Toronto, Canada is the town of Oakville, ON, famous for its history as a shipbuilding port on Lake Ontario.

The city of Raleigh, N.C., is known as "The City of Oaks."

The Jurupa Oak tree – a clonal colony of *Quercus palmeria* or Palmer's oak found in Riverside County, California – is believed to be the world's oldest organism at 13,000 years.*[44]

Large groups of very old oak trees are rare. One of the oldest groups of oak trees, found in Poland, is about 480 years old, which was assessed by dendrochronological methods.*[45]

In Republican Rome a crown of oak leaves was given to those who had saved a life of a citizen in battle; it was called the "civic oak" .*[39]

39.7.4 Famous oak trees

Main article: List of notable trees

- The Emancipation Oak is designated one of the 10 Great Trees of the World by the National Geographic Society and is part of the National Historic Landmark district of Hampton University.

Tamme-Lauri oak is the thickest and oldest tree in Estonia.

- The Ivenack Oak which is one of the largest trees in Europe is located in Mecklenburg-Vorpommern, Germany, and is approximately 800 years old.*[46]
- The Bowthorpe Oak, located in Bourne, Lincolnshire, is thought to be 1,000 years old. It was featured in the Guinness Book of World Records and was filmed for a TV documentary for its astonishing longevity.*[46]
- The Minchenden (or Chandos) Oak, in Southgate, London, is said to be the largest oak tree in England (already 27 feet or 8.2 meters in girth in the nineteenth century), and is perhaps 800 years old.*[47]
- The Seven Sisters Oak is the largest certified southern live oak tree. Located in Mandeville, Louisiana, it is estimated to be up to 1,500 years old with a trunk that measures 38 ft (11.6 meters).*[48]*[49]
- The Major Oak is an 800–1000 year old tree located in Sherwood Forest, Nottinghamshire. According to folklore, it was used by Robin Hood for shelter.
- Friendship Oak is a 500-year-old southern live oak located in Long Beach, Mississippi.
- The Crouch Oak is believed to have originated in the 11th Century and is located in Addlestone, Surrey. It is an important symbol of the town with many local businesses adopting its name. It used to mark the boundary of Windsor Great Park. Legend says that Queen Elizabeth I stopped by it and had a picnic.
- The Angel Oak is a southern live oak located in Angel Oak Park on John's Island near Charleston, South Carolina. The Angel Oak is estimated to be in excess of 1400 years old, stands 66.5 ft (20.3 m) tall, and measures 28 ft (8.5 m) in circumference.
- The Kaiser's Oak, located at the village of Gommecourt in Artois, France, named in honour of Kaiser Wilhelm II, symbolically marked from late 1914 to April 1917 the furthest point in the West of the German Imperial Army during World War One.

39.8 Historical note on Linnaean species

Linnaeus described only five species of oak from eastern North America, based on general leaf form. These were white oak, *Quercus alba*; chestnut oak, *Q. montana*; red oak, *Q. rubra*; willow oak *Q. phellos*; and water oak, *Q. nigra*. Because he was dealing with confusing leaf forms, the *Q. montana* and *Q. rubra* specimens actually included mixed foliage of more than one species.

39.9 See also

- Donar's Oak
- Fab Tree Hab
- Foloi oak forest
- Goethe Oak
- List of plants poisonous to equines
- List of Quercus species
- Oak Apple Day
- Thousand Oaks, California

39.10 References

[1] *Sunset Western Garden Book,* 1995, Leisure Arts, pp. 606–607, ISBN 0376038519.

[2] Hogan, C. Michael (2012) *Oak*. ed. Arthur Dawson. Encyclopedia of Earth. National Council for Science and the Environment. Washington DC

[3] Conrad, Jim. "Oak Flowers". backyardnature.com. 2011-12-12. Retrieved 2013-11-03.

[4] Williams, Joseph H.; Boecklen, William J. & Howard, Daniel J. (2001). "Reproductive processes in two oak (*Quercus*) contact zones with different levels of hybridisation". *Heredity* **87** (6): 680–690. doi:10.1046/j.1365-2540.2001.00968.x.

[5] Arnold, M. L. (1997). *Natural Hybridization and Evolution*. New York: Oxford University Press. ISBN 0-19-509974-5.

[6] Conte, L.; Cotti, C. & Cristofolini, G. (2007). "Molecular evidence for hybrid origin of *Quercus crenata* Lam. (Fagaceae) from *Q-cerris* L. and *Q-suber* L.". *Plant Biosystems* **141** (2): 181–193. doi:10.1080/11263500701401463.

[7] Gomory, D. & Schmidtova, J. (2007). "Extent of nuclear genome sharing among white oak species (*Quercus* L. subgen. *Lepidobalanus* (Endl.) Oerst.) in Slovakia estimated by allozymes". *Plant Systematics and Evolution* **266** (3–4): 253–264. doi:10.1007/s00606-007-0535-0.

[8] Kelleher, C. T.; Hodkinson, T. R.; Douglas, G. C. & Kelly, D. L. (2005). "Species distinction in Irish populations of *Quercus petraea* and *Q. robur*: Morphological versus molecular analyses". *Annals of Botany* **96** (7): 1237–1246. doi:10.1093/aob/mci275. PMID 16199484.

[9] Frascaria, N.; Maggia, L.; Michaud, M. & Bousquet, J. (1993). "The RBCL Gene Sequence from Chestnut Indicates a Slow Rate of Evolution in the Fagaceae". *Genome* **36** (4): 668–671. doi:10.1139/g93-089. PMID 8405983.

[10] Manos, P. S.; Stanford, A. M. (2001). "The historical biogeography of Fagaceae: Tracking the tertiary history of temperate and subtropical forests of the Northern Hemisphere". *International Journal of Plant Sciences* **162** (Suppl. 6): S77–S93. doi:10.1086/323280.

[11] Raven, Peter H.; Johnson, George B.; Losos, Jonathan B.; Singer, Susan R. (2005). *Biology* (Seventh ed.). New York: McGraw Hill. ISBN 0-07-111182-4.

[12] Cheese. swaledalecheese.co.uk

[13] Kala, C.P. (2004). Studies on the indigenous knowledge, practices and traditional uses of forest products by human societies in Uttarakhand state of India. GBPIHED, Almora, India

[14] Kala, C.P. (2010). *Medicinal Plants of Uttarakhand: Diversity Livelihood and Conservation*. BioTech Books, Delhi, ISBN 8176222097.

[15] D. S. Vohra (1 June 2004). *Bach Flower Remedies: A Comprehensive Study*. B. Jain Publishers. p. 3. ISBN 978-81-7021-271-3. Retrieved 2 September 2013.

[16] "Flower remedies". Cancer Research UK. Retrieved September 2013.

[17] *The Natural Communities of Virginia Classification of Ecological Community Groups* (Version 2.3), Virginia Department of Conservation and Recreation, 2010. Dcr.virginia.gov. Retrieved on 2011-12-10.

[18] Schafale, M. P. and A. S. Weakley. 1990. *Classification of the natural communities of North Carolina: third approximation*. North Carolina Natural Heritage Program, North Carolina Division of Parks and Recreation.

[19] "Truffle Glossary: Black Truffles". thenibble.com. 2010-07-01. Retrieved 1 July 2010.

[20] "Truffle Glossary: White Truffles". thenibble.com. 2010-07-01. Retrieved 1 July 2010.

[21] Kappelle, M. (2006). "Neotropical montane oak forests: overview and outlook", pp 449–467 in: Kappelle, M. (ed.). *Ecology and conservation of neotropical montane oak forests*. Ecological Studies No. 185. Springer-Verlag, Berlin, doi:10.1007/3-540-28909-7_34 ISBN 978-3-540-28908-1.

[22] Lorimer, C.G. (2003) Editorial: The decline of oak forests. American Institute of Biological Sciences.

[23] Oldfield, S. & Eastwood, A. (2007) The Red List of Oaks Flora & Fauna International (FFI) and Botanic Gardens Conservation International (BGCI) ISBN 978-1-903703-25-0

[24] Kala, C.P. (2012). *Biodiversity, communities and climate change*. Teri Publications, New Delhi, ISBN 817993442X.

[25] Carpenter, Paul (1990). *Plants in the Landscape*. New York: W.H. Freeman and Company. p. 73. ISBN 0716718081.

[26] "Trees: Oak Insects and Diseases: Gypsy Moth". TreeHelp.com. Retrieved 27 April 2010.

[27] Mougou, A.; Dutech, C.; Desprez-Loustau, M. -L. (2008). "New insights into the identity and origin of the causal agent of oak powdery mildew in Europe". *Forest Pathology* **38** (4): 275. doi:10.1111/j.1439-0329.2008.00544.x.

[28] Kinver, Mark (28 April 2010). "Oak disease 'threatens landscape'". *BBC News*. Retrieved 29 April 2010.

[29] "Invasion of toxic moths". *The Northern Echo*. July 10, 2012.

[30] Schierz, Kai Uwe (2004). "Von Bonifatius bis Beuys, oder: Vom Umgang mit heiligen Eichen". In Hardy Eidam, Marina Moritz, Gerd-Rainer Riedel, Kai-Uwe Schierz. *Bonifatius: Heidenopfer, Christuskreuz, Eichenkult* (in German). Stadtverwaltung Erfurt. pp. 139–45.

[31] "Trees – Arbor Day Foundation". Arborday.org. Retrieved 27 April 2010.

[32] "Oak Trees". arborday.org. Retrieved 27 April 2010.

[33] "Oak as a Symbol". *Venables Oak*. Retrieved 26 September 2012.

[34] "Political or Symbolic". *Extended Definition: oak*. Retrieved 26 September 2012.

[35] Pickles, Eric. "The Conservative Party". Conservatives.com. Retrieved 27 April 2010.

[36] Coalition Government 1989 To 1992. progressivedemocrats.ie

[37] Frazer, James George (1922). *The Golden Bough*. Chapter XV: The Worship of the Oak.

[38] Taylor, John W. (September 1979). "Tree Worship", *Mankind Quarterly*, pp. 79–142.

[39] *Oak. A Dictionary of Literary Symbols* (Cambridge).

[40] von Staufer, Maria. "The Chronological History of the Christmas Tree". *The Christmas Archives*. Retrieved 7 February 2010.

[41] War Song, *The Poetry of various Glees, Songs. and Company, London, 1798*

[42] Millais, J.G. (1899) *Life and Letters of Sir John Everett Millais*, vol. 1, p. 166, London : Methuen.

[43] Arborecology, containing a photograph of the Millais oak. arborecology.co.uk

[44] Thaindian News: Jurupa Oak tree is world's oldest organism at 13,000 years. December 24, 2009. Thaindian.com. Retrieved on 2011-12-10.

[45] Ufnalski K. The oldest groups of oak trees in Poland. Proceedings of EuroDendro 2008 "The long history of wood utilization" News of Forest History Nr. V (39)/2008:83–84

[46] Bermosa, Nobert. "Famous Oak Trees in the World". Retrieved 30 September 2012.

[47] Geograph: TQ2993: Minchenden Oak, Garden of Remembrance, Waterfall Road, N14

[48] Seven Sisters Oak. americanforests.org

[49] "Seven Sisters Oak". *100 Oaks Project*. 4 December 2009.

39.11 Bibliography

- Byfield, Liz (1990) *An oak tree*, Collins book bus, London : Collins Educational, ISBN 0-00-313526-8
- Philips, Roger. Trees of North America and Europe, Random House, Inc., New York ISBN 0-394-50259-0, 1979.
- Logan, William B. (2005) *Oak : the frame of civilization*, New York ; London : W.W. Norton, ISBN 0-393-04773-3
- Paterson, R.T. (1993) *Use of trees by livestock*, **5**: *Quercus*, Chatham : Natural Resources Institute, ISBN 0-85954-365-X
- Royston, Angela (2000) *Life cycle of an oak tree*, Heinemann first library, Oxford : Heinemann Library, ISBN 0-431-08391-6
- Savage, Stephen (1994) *Oak tree*, Observing nature series, Hove : Wayland, ISBN 0-7502-1196-2
- Tansley, Arthur G., Sir (1952) *Oaks and oak woods*, Field study books, London : Methuen.
- Żukow-Karczewski, Marek. *Dąb – król polskich drzew* (Oak – the king of the Polish trees), "AURA" (A Monthly for the protection and shaping of human environment), 9/88.

39.12 External links

- *Flora of China – Cyclobalanopsis*
- Flora Europaea: *Quercus*
- Oaks from Bialowieza Forest
- Common Oaks of Florida
- Oaks of the world
- The Global Trees Campaign The Red List of Oaks and Global Survey of Threatened Quercus
- Latvia - the land of oaks
- Janka Hardness Scale – The Janka Hardness Scale for many Exotic and Domestic species
- Eichhorn, Markus (May 2010). "Oak – A Very English Tree". *Test Tube*. Brady Haran for the University of Nottingham.

Chapter 40

Quercus robur

Quercus robur is commonly known as the **English oak** or **pedunculate oak** or **French oak**. It is native to most of Europe, and to Anatolia and to Israel to the Caucasus, and also to parts of North Africa.

40.1 Taxonomy

Ancient pedunculate oaks at Wistman's Wood in Devon, England

Q. robur (Latin *quercus*, "oak" + *robur* "strength, hard timber") is the type species of the genus (the species by which the oak genus *Quercus* is defined), and a member of the white oak section *Quercus* section *Quercus*. The populations in Italy, southeast Europe, and Asia Minor and the Caucasus are sometimes treated as separate species, *Q. brutia* Tenore, *Q. pedunculiflora* K. Koch and *Q. haas* Kotschy respectively.

A close relative is the Sessile Oak (*Q. petraea*), which shares much of its range. *Q. robur* is distinguished from this

species by its leaves having only a very short stalk 3–8 mm (0.12–0.31 in) long, and by its pedunculate (stalked) acorns. The two often hybridise in the wild, the hybrid being known as *Quercus* × *rosacea*.

40.2 Description

An old English oak in Baginton, England

Quercus robur is a large deciduous tree, with circumference of grand oaks from 4 m (13 ft) to exceptional 12 m (39 ft). The Majesty Oak with a circumference of 12.2 m (40 ft) is the thickest tree in Great Britain, and the Kaive Oak in Latvia with a circumference of 10.2 m (33 ft) is the thickest tree in Northern Europe. *Q. robur* has lobed and nearly sessile (very short-stalked) leaves 7–14 cm (2.8–5.5 in) long. Flowering takes place in mid spring, and their fruit, called acorns, ripen by the following autumn. The acorns are 2–2.5 cm (0.79–0.98 in) long, pedunculate (having a peduncle or acorn-stalk, 3–7 cm (1.2–2.8 in) long) with one to four acorns on each peduncle.

It is a long-lived tree, with a large wide spreading crown of rugged branches. While it may naturally live to an age of a few centuries, many of the oldest trees are pollarded or coppiced, both pruning techniques that extend the tree's potential lifespan, if not its health. Two individuals of notable longevity are the Stelmužė Oak in Lithuania and the Granit Oak in Bulgaria, which are believed to be more than 1,500 years old, possibly making them the oldest oaks in Europe; another specimen, called the 'Kongeegen' ('Kings Oak'), estimated to be about 1,200 years old, grows in Jaegerspris, Denmark. Yet another can be found in Kvilleken, Sweden, that is over 1,000 years old and 14 metres (46 ft) around.*[2] Of maiden (not pollarded) specimens, one of the oldest is the great oak of Ivenack, Germany. Tree-ring research of this tree and other oaks nearby gives an estimated age of 700 to 800 years old. Also the Bowthorpe Oak in Lincolnshire, England is estimated to be 1,000 years old, making it the oldest in the UK, although there is Knightwood Oak in the New Forest which is also said to be as old. Highest density of the grand oak trees Q. robur with a circumference 4 metres (13 ft) and more is in Latvia.*[3]

40.3 Ecological importance

Within its native range *Q. robur* is valued for its importance to insects and other wildlife. Numerous insects live on the leaves, buds, and in the acorns. Q.robur supports the highest biodiversity of insect herbivores of any British plant (>400 spp). The acorns form a valuable food resource for several small mammals and some birds, notably Eurasian Jays *Garrulus glandarius*. Jays were overwhelmingly the primary propagators*[4] of oaks before humans began planting them commercially, because of their habit of taking acorns from the umbra of its parent tree and burying it undamaged elsewhere. Mammals, notably squirrels who tend to hoard acorns and other nuts most often leave them too abused to grow in the action of moving or storing them.

40.4 Commercial forestry

Quercus robur' is planted for forestry, and produces a long-lasting and durable heartwood, much in demand for interior and furniture work. The wood of *Q. robur* is identified by a close examination of a cross-section perpendicular to fibres. The wood is characterised by its distinct (often wide) dark and light brown growth rings. The earlywood displays a vast number of large vessels (~0.5 mm (0.020 in) diameter). There are rays of thin (~0.1 mm (0.0039 in)) yellow or light brown lines running across the growth rings. The timber is around 720 kg (1,590 lb) per cubic meter in density.*[5]

40.5 Cultivation

Quercus robur is cultivated as an ornamental tree in the temperate regions of most continents. A number of cultivars are grown in gardens and parks and in arboreta and botanical gardens. The most common cultivar is *Quercus robur* 'Fastigiata', and is the exception among *Q. robur* cultivars which are generally smaller than the standard tree, growing to between 10–15 m and exhibit unusual leaf or crown shape characteristics.

In Australia

English Oak is one of the most common park trees in south-eastern Australia, noted for its vigorous, luxuriant growth. In Australia, it grows very quickly to a tree of 20 m (66 ft) tall by up to 20 m (66 ft) broad, with a low-branching canopy. Its trunk and secondary branches are very thick and solid and covered with deep-fissured blackish-grey bark.*[6] The largest example in Australia is in Donnybrook, Western Australia.*[7] Native Australian oaks are quite unrelated to the European oaks.

40.5.1 Cultivars

- *Quercus robur* 'Fastigiata' ("Cypress Oak"), probably the most common cultivated form, it grows to a large imposing tree with a narrow columnar habit. The fastigiate oak was originally propagated from an upright tree that was found in central Europe.
- *Quercus robur* 'Concordia' ("Golden Oak"), a small very slow-growing tree, eventually reaching 10 m (33 ft), with bright golden-yellow leaves throughout spring and summer. It was originally raised in Van Geert's nursery at Ghent in 1843.
- *Quercus robur* 'Pendula' ("Weeping Oak"), a small to medium-sized tree with pendulous branches, reaching up to 15 m.
- *Quercus robur* 'Purpurea' is another cultivar growing to 10 m (33 ft), but with purple coloured leaves.
- *Quercus robur* 'Filicifolia' ("Cut-leaved Oak") is a cultivar where the leaf is pinnately divided into fine forward pointing segments.

40.5.2 Hybrids

Along with the naturally occurring *Q.* × *rosacea*, several hybrids with other white oak species have also been produced in cultivation, including Turner's Oak *Q.* × *turnerii*, Heritage Oak *Q.* × *macdanielli*, and Two Worlds Oak *Q.* × *bimundorum*, the latter two developed by nurseries in the United States.

- *Q.* × *bimundorum* (*Q. alba* × *Q. robur*) (Two Worlds Oak)
- *Q.* × *macdanielli* (*Q. macrocarpa* × *Q. robur*) (Heritage Oak)
- *Q.* × *rosacea* Bechst. (*Q. petraea* x *Q. robur*), a hybrid of the Sessile Oak and English Oak. It is usually of intermediate character between its parents, however it does occasionally exhibit more pronounced characteristics of one or the other parent.
- *Q.* × *turnerii* Willd. (*Q. ilex* × *Q. robur*) (Turner's Oak), a semi-evergreen tree of small to medium size with a rounded crown; it was originally raised at Mr. Turner's nursery, Essex, UK, in 1783. An early specimen is at the Royal Botanic Gardens, Kew.*[8]
- *Q.* × *warei* (*Q. robur fastigiata* x *Q. bicolor*), a hybrid between Upright English Oak and the Swamp White Oak. The selections within this hybrid include the (Regal Prince) 'Long'*[9] cultivar and the (Kindred Spirit) 'Nadler' cultivar.*[10]

40.5.3 Diseases

- Acute oak decline
- Powdery mildew caused by *Erysiphe alphitoides**[11]
- Sudden oak death

40.6 Symbolism

40.6.1 Basque Country

In the Basque Country (Spain)and (France) the oak symbolises the traditional basque liberties. This is based on the 'tree of Gernika', an ancient oak tree located in Gernika, below which since at least the 13th century the Lords of Biscay first, and afterwards their successors the Kings of Castile and the Kings of Spain solemnly swore to uphold the charter of Biscay, which secured widespread rights to the inhabitants of Biscay. Since the 14th century, the Juntas Generales (the parliament of Biscay) gathers in a building next to the oak tree, and symbolically passes its laws under the tree as well. Nowadays, the Lehendakari (Basque prime minister) swears his oath of office under the tree.

40.6.2 Bulgaria

The national coat of arms of Bulgaria includes two crossed oak branches with fruits - as shield (escutcheon) compartment.

40.6.3 Croatia

Oak leaves with acorns are depicted on the reverse of the Croatian 5 lipa coin, minted since 1993.*[12] The pedunculate oak of the Croatian region of Slavonia (considered a separate subspecies - *Slavonian Oak*) is a regional symbol of Slavonia and a national symbol of Croatia.*[13]

40.6.4 England

In England, the English oak has assumed the status of a national emblem. This has its origins in the oak tree at Boscobel House, where the future King Charles II hid from his Parliamentarian pursuers in 1650 during the English Civil War; the tree has since been known as the Royal Oak. This event was celebrated nationally on 29 May as Oak Apple Day, which is continued to this day in some communities.*[14] 'The Royal Oak' is the third most popular pub name in Britain (541 in 2007)*[15] and has been the name of eight major Royal Navy warships. The naval associations are strengthened by the fact that oak was the main construction material for sailing warships. The Royal Navy was often described as 'The Wooden Walls of Old England' *[16] (a paraphrase of the Delphic Oracle) and the Navy's official quick march is "Heart of Oak". Furthermore, the oak is the most common woodland tree in England.*[17] An oak tree has been depicted on the reverse of the pound coin (the 1987 and 1992 issues) and a sprig of oak leaves and acorns is the emblem of the National Trust.

40.6.5 Germany

In Germany, the oak tree is used as a typical object and symbol in romanticism. It can be found in several paintings of Caspar David Friedrich and in "Of the life of a Good-For-Nothing" written by Joseph Freiherr von Eichendorff as a symbol of the state protecting every man. In those works the oak is shown in different situations, with leaves and flowers or dead without any of its previous beauty. Those conditions are mostly symbols for the conditions Germany is in or going through. Furthermore, the oak's stem is a symbol for Germany's strength and stability. Oak branches were displayed on the reverse of the small coins of the old Deutsche Mark currency (1 through 10 Pfennigs; the 50 Pfennigs coin showed a woman planting an oak seedling), and are now also displayed on the reverse of the small German-issue Euro currency coins (1 through 5 cents).

40.6.6 Ireland

In Ireland, at Birr Castle, an example, over 400 years old has a girth of 6.5 m. It is known as the Carroll Oak, referring to the local Chieftains, Ely O'Carroll who ruled prior to Norman occupation.*[18]

40.6.7 Romania

The Romanian Rugby Union side are also known as *The Oaks.*

40.7 Chemistry

Grandinin/roburin E, castalagin/vescalagin, gallic acid, monogalloyl glucose (glucogallin) and valoneic acid dilactone, monogalloyl glucose, digalloyl glucose, trigalloyl glucose, rhamnose, quercitrin and ellagic acid are phenolic compounds found in *Q. robur*.*[19] The heartwood contains triterpene saponins.*[20]

40.8 See also

- Knopper gall

- Oak Marble gall
- Gernika Oak

40.9 References

[1] "The Plant List: A Working List of All Plant Species" .

[2] Moström, Jerker (May 2006). "The Oak Tree, from Peasant Torment to a Unifying Concept of Landscape Management" (PDF). *The Oak – History, Ecology Management and Planning*. Linköping, Sweden: National Heritage Board of Sweden.

[3] Eniņš, Guntis (2008). *100 dižākie un svētākie*, AS Lauku Avīze, p. 25. ISBN 978-9984-827-15-5

[4] White, John (1995). *Forest and Woodland Trees in Britain*. Oxford University Press. p. 131. ISBN 0-19-854883-4.

[5] British Oak. Niche Timbers. Accessed 19-08-2009.

[6] "Quercus robur" . Metrotrees.com.au. Retrieved 2012-05-02.

[7] Nina Smith (2009-12-10). "Australia's Biggest Oak Tree" . Donnybrookmail.com.au. Retrieved 2012-05-02.

[8] "Kew: Plants: Turner' s Oak, Quercus x turneri" . Rbgkew.org.uk. 1987-10-16. Retrieved 2012-05-02.

[9] "Plant of the Month" . Buckeyegardening.com. Retrieved 2012-05-02.

[10] ""International Oak Society Link"". Oaknames.org. Retrieved 2012-05-02.

[11] "Oak mildew" . Forestry Commission. 2013. Retrieved 13 April 2013.

[12] Croatian National Bank. Kuna and Lipa, Coins of Croatia: 5 Lipa Coin. – Retrieved on 31 March 2009.

[13] "Croatian National Symbols" . www.kwintessential.co.uk/. Retrieved 2013-04-23.

[14] "Wiltshire - Moonraking - Oak Apple Day" . BBC. 1931-05-29. Retrieved 2012-05-02.

[15] "Real Ale and Pub News Features Archive" . Solihullcamra.org.uk. 2007-11-15. Retrieved 2012-05-02.

[16] "National Maritime Museum" . Nmm.ac.uk. Retrieved 2012-05-02.

[17] Smith, Steve. "The National Inventory of Woodland and Trees - England" (PDF). UK: Forestry Commission. Table 1. p. 52.

[18] Fifty Trees of Distinction by Prof. D.A. Webb and the Earl of Ross. Booklet, published by Birr Castle Demesne, 2000.

[19] Analysis of oak tannins by liquid chromatography-electrospray ionisation mass spectrometry. Pirjo Mämmelä, Heikki Savolainenb, Lasse Lindroosa, Juhani Kangasd and Terttu Vartiainen, Journal of Chromatography A, Volume 891, Issue 1, 1 September 2000, Pages 75-83, doi:10.1016/S0021-9673(00)00624-5

[20] Identification of triterpene saponins in Quercus robur L. and Q. petraea Liebl. Heartwood by LC-ESI/MS and NMR. Arramon G, Saucier C, Colombani D and Glories Y, Phytochem Anal., November-DEcember 2002, volume 13, issue 6, pages 305-310, PubMed

- Flora Europaea: *Quercus robur*
- Bean, W. J. (1976). *Trees and shrubs hardy in the British Isles* 8th ed., revised. John Murray.
- Rushforth, K. (1999). *Trees of Britain and Europe*. HarperCollins ISBN 0-00-220013-9.
- (French) Chênes: *Quercus robur*

40.10 External links

- Oaks from Bialowieza Forest (biggest oak cluster with the monumental sizes in Europe) {English}
- Photos and location details of large English oak trees
- Latvia - the land of oaks
- Den virtuella floran - Distribution
- *Quercus robur* at the Encyclopedia of Life

Seedling sprouting from its acorn

An oak sprout in a glass container

bark and wood

Quercus robur - *MHNT*

The Gyula Juhász memorial tree in Makó

Q. robur *'Concordia'*

Chapter 41

Quercus petraea

Shoot with leaves and acorn

Quercus petraea (syn. ***Quercus sessiliflora***),*[1] the **sessile oak**, also known as the **Cornish oak** or **durmast oak**, is a species of oak tree native to most of Europe, into Anatolia and Iran.

The sessile oak is the official National tree of Ireland, where it is known as the **Irish oak** or *Dair ghaelach* ("Gaelic oak").*[2] It has also been designated the national tree of Wales, where it is also called **Welsh oak***[3] and is considered the Cornish national tree and is referred to as the **Cornish oak**.*[4]*[5]

41.1 Description

The sessile oak is a large deciduous tree up to 20–40 m (66–131 ft) tall, in the white oak section of the genus (*Quercus* sect. *Quercus*) and similar to the Pedunculate oak, *Q. robur*, with which it overlaps extensively in range. The leaves

An inosculated tree

are 7–14 cm (2.8–5.5 in) long and 4–8 cm (1.6–3.1 in) broad, evenly lobed with five to six lobes on each side, and a 1-centimetre-long (0.39 in) petiole. The flowers are catkins, produced in the spring. The fruit is an acorn 2–3 cm (0.79–1.18 in) long and 1–2 cm (0.39–0.79 in) broad, which matures in about six months.

41.2 Comparison with pedunculate oak (*Quercus robur*)

Significant botanical differences from pedunculate oak include the stalked leaves, and the stalkless (sessile) acorns from which one of its common names is derived. It occurs in upland areas over 300 m (984 ft) with higher rainfall and shallow, acidic, sandy soils. Its specific epithet *petraea* means "of rocky places".*[6] *Quercus robur*, on the other hand, prefers deeper, richer soils at lower altitude. Fertile hybrids with *Quercus robur* named *Quercus* × *rosacea* are found wherever the two parent species occur and share or are intermediate in characters between the parents.

41.3 Uses

In cultivation, this tree has gained the Royal Horticultural Society's Award of Garden Merit.*[7] The wood is important, used for construction purposes (particularly timber framing), shipbuilding, and oak barrels for wine.

41.4 Pontfadog Oak

What was considered to be the oldest oak tree in the UK was a sessile oak, the *Pontfadog Oak*. This grew near Chirk in North Wales. It was understood to be over 1,200 years old, an age that was due to regular pollarding for much of its life. The hollow trunk had a girth of 12.9 metres (42 ft 5 in). It was lost in April 2013 when it blew down in high winds.*[8]

41.5 Diseases and Pests

- Acute oak decline
- Sudden oak death
- The Welsh Oak Longhorn Beetle (syn. *Pyrrhidium sanguineum*) is named for its host tree; the larvae feeding at the bark interface of dead wood.*[9]

41.6 Notes

[1] "Quercus sessiliflora Salisb.". USDA GRIN Taxonomy for Plants.

[2] *Our Trees* (2000). Tree Council of Ireland

[3] "Tree trail with worldwide flavour", BBC News, 23 July 2004

[4] James Minahan, The complete guide to national symbols and emblems , Volume 1, 2009

[5] http://www.thisiscornwall.co.uk/native-trees-thrive-future/story-13244009-detail/story.html

[6] Harrison, Lorraine (2012). *RHS Latin for gardeners*. United Kingdom: Mitchell Beazley. p. 224. ISBN 9781845337315.

[7] http://apps.rhs.org.uk/plantselector/plant?plantid=6127

[8] "Pontfadog Oak: 1,200-year-old tree toppled by winds". BBC News Online. 18 April 2013.

[9] Bullock, J.A. 1992. Host Plants of British Beetles: A List of Recorded Associations - Amateur Entomologists' Society (AES) publication volume 11a: A supplement to A Coleopterist's Handbook.

41.7 References

- Flora Europaea: *Quercus petraea*
- Bean, W. J. (1976). *Trees and shrubs hardy in the British Isles* 8th ed., revised. John Murray.

- Rushforth, K. (1999). *Trees of Britain and Europe*. HarperCollins ISBN 0-00-220013-9.
- (French) Chênes: *Quercus petraea*
- Den virtuella floran - Distribution

41.8 See also

Chapter 42

Pine

This article is about the tree. For other uses of the term "pine", see Pine (disambiguation).

Pines are conifer trees in the genus ***Pinus*** /ˈpiːnuːs/,* [1] in the family Pinaceae. They are the only genus in the subfamily **Pinoideae**. Counting varieties and subspecies, the plant list of the Royal Botanic Gardens, Kew and Missouri Botanical Garden accepts 175 names of pines as current, together with some thirty or forty unresolved and many more synonyms or misapplied.* [2]

42.1 Etymology

The modern English name *pine* derives from Latin *pinus* which some have traced to the Indo-European base *pīt- 'resin' (source of English pituitary).* [3] In the past (pre-19th century) they were often known as *fir*, from Old Norse *fyrre*, by way of Middle English *firre*. The Old Norse name is still used for pines in some modern north European languages, in Danish *fyr*, in Norwegian *fura/fure/furu*, Swedish *fura/furu*, Dutch *vuren*, and *Föhre* in German, but in modern English, *fir* is now restricted to fir (*Abies*) and Douglas-fir (*Pseudotsuga*).

42.2 Taxonomy, nomenclature and codification

Main article: Pinus classification

Pines are gymnosperms. The genus is divided into three subgenera, based on cone, seed and leaf characters:

- *Pinus* subg. *Pinus*, the yellow, or hard pine group, generally with harder wood and two or three needles per fascicle.* [4]
- *Pinus* subg. *Ducampopinus*, the foxtail or pinyon group
- *Pinus* subg. *Strobus*, the white, or soft pine group, generally with softer wood and five needles per fascicle* [4]

42.3 Distribution

Most regions of the Northern Hemisphere (see List of pines by region) host some native species of pines. One species (Sumatran pine) crosses the equator in Sumatra to 2°S. In North America, various species occur in regions at latitudes from as far as 66°N to as far south as 12°N.

Various species have been introduced to temperate and subtropical regions of both hemispheres, where they are grown as timber or cultivated as ornamental plants in parks and gardens. A number of such introduced species have become invasive* [5] and threaten native ecosystems.

A Khasi pine in Benguet, Philippines

42.4 Description

Pines are evergreen, coniferous resinous trees (or rarely shrubs) growing 3–80 m tall, with the majority of species reaching 15–45 m tall. The smallest are Siberian dwarf pine and Potosi pinyon, and the tallest is a 268.35-feet (81.79-meter) tall ponderosa pine located in southern Oregon's Rogue River-Siskiyou National Forest.*[6]

The bark of most pines is thick and scaly, but some species have thin, flaking bark. The branches are produced in regular "pseudo whorls", actually a very tight spiral but appearing like a ring of branches arising from the same point. Many pines are *uninodal*, producing just one such whorl of branches each year, from buds at the tip of the year's new shoot, but others are *multinodal*, producing two or more whorls of branches per year. The spiral growth of branches, needles, and cone scales are arranged in Fibonacci number ratios. The new spring shoots are sometimes called "candles"; they are covered in brown or whitish bud scales and point upward at first, then later turn green and spread outward. These "candles" offer foresters a means to evaluate fertility of the soil and vigour of the trees.

Pines are long-lived, typically reaching ages of 100–1,000 years, some even more. The longest-lived is the Great Basin bristlecone pine, *Pinus longaeva*. One individual of this species, dubbed "Methuselah", is one of the world's oldest living organisms at around 4,600 years old. This tree can be found in the White Mountains of California.*[7]

*Huangshan pine (*Pinus hwangshanensis*), Anhui, China*

An older tree, now cut down, was dated at 4,900 years old. It was discovered in a grove beneath Wheeler Peak and it is now known as "Prometheus" after the Greek immortal.

42.4.1 Foliage

Pines have four types of leaf:

Ancient Pinus longaeva*, Nevada, USA*

- *Seed leaves* (cotyledons) on seedlings, born in a whorl of 4–24.
- *Juvenile leaves*, which follow immediately on seedlings and young plants, 2–6 cm long, single, green or often blue-green, and arranged spirally on the shoot. These are produced for six months to five years, rarely longer.
- *Scale leaves*, similar to bud scales, small, brown and non-photosynthetic, and arranged spirally like the juvenile leaves.
- *Needles*, the adult leaves, which are green (photosynthetic), bundled in clusters (*fascicles*) of 1–6, commonly 2–5, needles together, each fascicle produced from a small bud on a dwarf shoot in the axil of a scale leaf. These bud scales often remain on the fascicle as a basal sheath. The needles persist for 1.5–40 years, depending

Bark chips

on species. If a shoot is damaged (e.g. eaten by an animal), the needle fascicles just below the damage will generate a bud which can then replace the lost leaves.

42.4.2 Cones

Pines are mostly monoecious, having the male and female cones on the same tree, though a few species are sub-dioecious with individuals predominantly, but not wholly, single-sex. The male cones are small, typically 1–5 cm long, and only present for a short period (usually in spring, though autumn in a few pines), falling as soon as they have shed their pollen. The female cones take 1.5–3 years (depending on species) to mature after pollination, with actual fertilization delayed one year. At maturity the female cones are 3–60 cm long. Each cone has numerous spirally arranged scales, with two seeds on each fertile scale; the scales at the base and tip of the cone are small and sterile, without seeds. The seeds are mostly small and winged, and are anemophilous (wind-dispersed), but some are larger and have only a vestigial wing, and are bird-dispersed (see below). At maturity, the cones usually open to release the seeds, but in some of the bird-dispersed species (e.g. whitebark pine), the seeds are only released by the bird breaking the cones open. In others, the seeds are stored in closed ("serotinous") cones for many years until an environmental cue triggers the cones to open, releasing the seeds. The most common form of serotiny is pyriscence, in which a resin binds the cones shut until melted by a forest fire.

42.5 Ecology

Pines grow well in acid soils, some also on calcareous soils; most require good soil drainage, preferring sandy soils, but a few (e.g. lodgepole pine) will tolerate poorly drained wet soils. A few are able to sprout after forest fires (e.g. Canary Island pine). Some species of pines (e.g. bishop pine) need fire to regenerate, and their populations slowly decline under fire suppression regimes. Several species are adapted to extreme conditions imposed by elevation and latitude (e.g. Siberian dwarf pine, mountain pine, whitebark pine and the bristlecone pines). The pinyon pines and a number of others, notably Turkish pine and gray pine, are particularly well adapted to growth in hot, dry semi-desert climates.

The seeds are commonly eaten by birds and squirrels. Some birds, notably the spotted nutcracker, Clark's nutcracker

and Pinyon jay, are of importance in distributing pine seeds to new areas. Pine needles are sometimes eaten by some Lepidoptera (butterfly and moth) species (see list of Lepidoptera that feed on pines), the Symphytan species pine sawfly, and goats.

42.6 Uses

Pines are among the most commercially important tree species valued for their timber and wood pulp throughout the world. In temperate and tropical regions, they are fast-growing softwoods that will grow in relatively dense stands, their acidic decaying needles inhibiting the sprouting of competing hardwoods. Commercial pines are grown in plantations for timber that is denser, more resinous, and therefore more durable than spruce (*Picea*). Pine wood is widely used in high-value carpentry items such as furniture, window frames, panelling, floors and roofing, and the resin of some species is an important source of turpentine.

Many pine species make attractive ornamental plantings for parks and larger gardens with a variety of dwarf cultivars being suitable for smaller spaces. Pines are also commercially grown and harvested for Christmas trees. Pine cones, the largest and most durable of all conifer cones, are craft favorites. Pine boughs, appreciated especially in wintertime for their pleasant smell and greenery, are popularly cut for decorations. A number of species are attacked by nematodes, causing pine wilt disease, which can kill some quickly. Pine needles are also used for making decorative articles like baskets, trays, pots, etc. This Native American skill is now being replicated across the world. Pine needle handicrafts are made in the US, Canada, Mexico, Nicaragua and India. Pine needles serve as food for various Lepidoptera. See List of Lepidoptera that feed on pines.

Because pines have no insect or decay resistant qualities after logging, they are generally recommended for construction purposes as indoor use only (ex. indoor drywall framing). This wood left outside can be expected to last no more than 12–18 months depending on the local climate. It is commonly referred to by several different names which include North American timber, SPF (spruce, pine, fir) and whitewood.

42.6.1 Food

Some species have large seeds, called pine nuts, that are harvested and sold for cooking and baking. They are an essential ingredient of *Pesto alla genovese*.

The soft, moist, white inner bark (cambium) found clinging to the woody outer bark is edible and very high in vitamins A and C. It can be eaten raw in slices as a snack or dried and ground up into a powder for use as an ersatz flour or thickener in stews, soups, and other foods, such as bark bread. Adirondack Indians got their name from the Mohawk Indian word *atirú:taks*, meaning "tree eaters".

42.6.2 Biomedical

A tea made by steeping young, green pine needles in boiling water (known as "tallstrunt" in Sweden) is high in vitamins A and C.

Pine has been listed as one of the 38 substances used to prepare Bach flower remedies,*[8] a kind of alternative medicine promoted for its effect on health. However according to Cancer Research UK, "there is no scientific evidence to prove that flower remedies can control, cure or prevent any type of disease, including cancer".*[9]

42.7 See also

- Christmas tree
- Pine barrens
- Pine-cypress forest
- Three Friends of Winter

42.8 Notes

[1] *Sunset Western Garden Book,* 1995:606–607

[2] The Plant List (2013). Version 1.1. Published on the Internet; http://www.theplantlist.org/ (accessed June 2014)

[3] pine. (2006). In Word Origins. Retrieved from http://www.credoreference.com/entry/acbwordorig/pine

[4] Burton Verne Barnes; Warren Herbert Wagner (January 2004). *Michigan Trees: A Guide to the Trees of the Great Lakes Region*. University of Michigan Press. pp. 81–. ISBN 0-472-08921-8.

[5] "Pinus ssp. (tree), General Impact". *Global Invasive Species Database*. Invasive Species Specialist Group. 13 March 2006. Retrieved 2 March 2011.

[6] Fattig, Paul (2011-01-23). "Tallest of the tall". *Mail Tribune* (Medford, Oregon). Retrieved 2011-01-27.

[7] Ryan, Michael; David M. Richardson (December 1999). "The Complete Pine". *BioScience* **49** (12): 1023–1024. doi:10.2307/1313736.

[8] D. S. Vohra (1 June 2004). *Bach Flower Remedies: A Comprehensive Study*. B. Jain Publishers. p. 3. ISBN 978-81-7021-271-3. Retrieved 2 September 2013.

[9] "Flower remedies". Cancer Research UK. Retrieved September 2013.

42.9 References

- Farjon, A. 1984, 2nd edition 2005. *Pines*. E. J. Brill, Leiden. ISBN 90-04-13916-8
- Little, E. L., Jr., and Critchfield, W. B. 1969. *Subdivisions of the Genus Pinus (Pines)*. US Department of Agriculture Misc. Publ. 1144 (Superintendent of Documents Number: A 1.38:1144).
- Richardson, D. M. (ed.). 1998. *Ecology and Biogeography of Pinus*. Cambridge University Press, Cambridge. 530 p. ISBN 0-521-55176-5
- Sulavik, Stephen B. 2007. *Adirondack; Of Indians and Mountains, 1535-1838*. Purple Mountain Press, Fleischmanns, NY. 244 p. ISBN 1-930098-79-0 ISBN 978-1-930098-79-4
- Mirov, N. T. 1967. *The Genus Pinus*. Ronald Press, New York (out of print).
- Classification of pines
- Gymnosperm Database - Pinus

42.10 Bibliography

- Mirov, N. T.; Stanley, R. G. (1959). "The Pine Tree". *Annual Review of Plant Physiology* **10**: 223. doi:10.1146/annurev.pp.10.060159.001255.
- Philips, Roger. Trees of North America and Europe, Random House, Inc., New York ISBN 0-394-50259-0, 1979.

42.11 External links

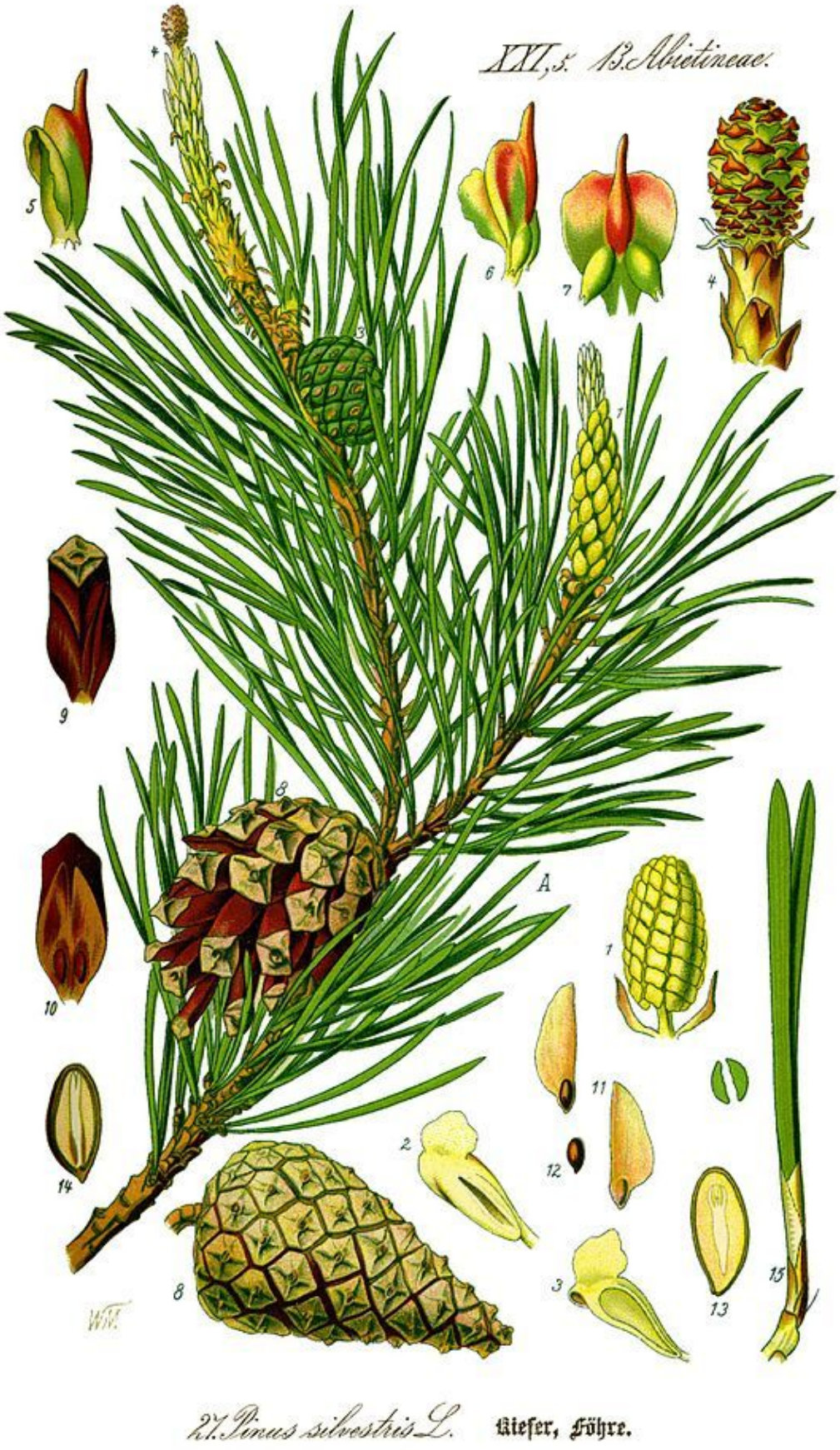


*Illustration of needles, cones, and seeds of Scots pine (*Pinus sylvestris*)*

*A prescribed fire in a European black pine (*Pinus nigra*) woodland, Portugal*

Logging Pinus ponderosa*, Arizona, USA*

Pinus sylvestris *prepared for transport, Hungary*

*Edible seeds of the Korean pine (*Pinus koraiensis*)*

Chapter 43

Scots pine

Scots pine (***Pinus sylvestris*** L.) is a species of pine that is native to Europe and Asia, ranging from western Europe to eastern Siberia, south to the Caucasus Mountains and Anatolia, and north to well inside the Arctic Circle in Scandinavia. In the north of its range, it occurs from sea level to 1,000 m, while in the south of its range it is a high altitude mountain tree, growing at 1,200–2,600 metres (3,900–8,500 ft) altitude. It is readily identified by its combination of fairly short, blue-green leaves and orange-red bark.*[2]*[3]*[4]*[5]

43.1 Botany

Leaves and cones, Poland

Pinus sylvestris is an evergreen coniferous tree growing up to 35 m in height*[6] and 1 m trunk diameter when mature, exceptionally to 45 metres (148 ft) tall and 1.7 metres (5 ft 7 in) trunk diameter and on very productive sites

Seedling with flatter, unpaired juvenile leaves

(in Estonia, there are some 220-year-old trees that are 46 metres (151 ft) tall in the forests of Järvselja*[7]). The bark is thick, scaly dark grey-brown on the lower trunk, and thin, flaky and orange on the upper trunk and branches. The habit of the mature tree is distinctive due to its long, bare and straight trunk topped by a rounded or flat-topped mass of foliage. The lifespan is normally 150–300 years, with the oldest recorded specimens (in Sweden and Norway) just over 700 years.*[2]*[3]*[4]*[8]

The shoots are light brown, with a spirally arranged scale-like pattern. On mature trees the leaves ('needles') are a glaucous blue-green, often darker green to dark yellow-green in winter, 2.5–5 centimetres (0.98–1.97 in) long and 1–2 millimetres (0.039–0.079 in) broad, produced in fascicles of two with a persistent grey 5–10 millimetres (0.20–0.39 in) basal sheath. On vigorous young trees the leaves can be twice as long, and occasionally occur in fascicles of three or four on the tips of strong shoots. Leaf persistence varies from two to four years in warmer climates, and up to nine years in subarctic regions. Seedlings up to one year old bear juvenile leaves; these are single (not in pairs), 2–3 cm long, flattened, with a serrated margin.*[2]*[4]*[8]

Ripe pollen cones, Poland

The seed cones are red at pollination, then pale brown, globose and 4–8 millimetres (0.16–0.31 in) diameter in their first year, expanding to full size in their second year, pointed ovoid-conic, green, then grey-green to yellow-brown at maturity, 3–7.5 centimetres (1.2–3.0 in) long. The cone scales have a flat to pyramidal apophysis, with a small prickle on the umbo. The seeds are blackish, 3–5 mm in length with a pale brown 12–20 millimetres (0.47–0.79 in) wing and are released when the cones open in spring 22–24 months after pollination. The pollen cones are yellow, occasionally pink, 8–12 millimetres (0.31–0.47 in) long; pollen release is in mid to late spring.[*][2][*][4][*][8]

43.1.1 Taxonomy

Over 100 *Pinus sylvestris* varieties have been described in the botanical literature, but only three or four are now accepted. They differ only minimally in morphology, but with more pronounced differences in genetic analysis and resin composition. Populations in westernmost Scotland are genetically distinct from those in the rest of Scotland and northern Europe, but not sufficiently to have been distinguished as a separate botanical variety. Trees in the far north of the range were formerly sometimes treated as var. *lapponica*, but the differences are clinal and it is not genetically distinct.[*][2][*][3][*][5][*][9][*][10][*][11][*][12][*][13][*][14][*][15]

- *Pinus sylvestris* var. *sylvestris*. The bulk of the range, from Scotland and Spain to central Siberia. Described above.
- *Pinus sylvestris* var. *hamata* Steven. The Balkans, northern Turkey, Crimea, and the Caucasus. Foliage more consistently glaucous all year, not becoming duller in winter; cones more frequently with a pyramidal apophysis.
- *Pinus sylvestris* var. *mongolica* Litv. Mongolia and adjoining parts of southern Siberia and northwestern China. Foliage duller green, shoots grey-green; leaves occasionally up to 12 cm long.
- *Pinus sylvestris* var. *nevadensis* D.H.Christ. The Sierra Nevada in southern Spain and possibly other Spanish populations (not considered distinct from var. *sylvestris* by all authors) Kalenicz. Ex Kom. Cones often with thicker scales, but doubtfully distinguishable on morphology.

Mature open cones and seeds

Pinus sylvestris *var.* hamata*, Crimea*

- *Pinus sylvestris* var. *cretacea* Kalenicz. ex Kom. From border regions between Russia and Ukraine.*[16]

43.2 Distribution

Scots pine is the only pine native to northern Europe, forming either pure forests or alongside Norway spruce, common juniper, silver birch, European rowan, Eurasian aspen and other hardwood species. In central and southern Europe, it occurs with numerous additional species, including European black pine, mountain pine, Macedonian pine, and Swiss pine. In the eastern part of its range, it also occurs with Siberian pine among other trees.*[3]*[4]

43.2.1 British Isles

Scattered survivors (two recently dead) of extensive deforestation at Glen Quoich, Scotland

The tree spread across the British Isles after the Last Glacial Maximum. Pollen records show that pine was present locally in southern England by 9,000 years ago having entered from northeast France and that it had spread as far north as the Lake District and North Pennines 500 years later.

It was present in Ireland over 8,800 years ago but absent from Wales at that time which suggests that Scots pine in Ireland had a separate Iberian origin. Pine expanded into Scotland between 8,000 and 8,500 years ago either from an independent refuge, from Scandinavia (via 'Doggerland') or from Ireland. As the climate warmed it became extinct from most of the British Isles around 5,500 years ago except in Scotland and at Kielder, Northumberland.

The Irish and western Scottish populations went through a massive decline around 4,000 years ago which ultimately led to the extinction of the Irish population between 2,000 and 1,000 years ago. It was replaced by large areas of blanket bog in western Scotland and Ireland though the reasons for its decline and extinction in England are not clear, but it may have been influenced by human activities.*[17]

In Britain it now occurs naturally only in Scotland. Historical and archaeological records indicate that it also occurred in Wales and England until about 300–400 years ago, becoming extinct there due to over-exploitation and grazing;

it has been re-introduced in these countries. Similar historical extinction and re-introduction applies to Ireland, Denmark and the Netherlands.[*][4][*][5][*][8][*][18] Whether it truly became extinct in England is unknown. It has been speculated that it may have survived wild long enough for trees used in cultivation in England to derive from native (rather than imported) sources.[*][19] Shakespeare (in *Richard II*) was familiar with the species in the 1590s, as was Evelyn in the early 1660s (*Sylva*), both around the time when Scots pine was thought to become extinct in England, but when landowners were also beginning ornamental and forestry planting.[*][19]

The Scots pine formed much of the Caledonian Forest which once covered much of the Scottish Highland. Over-cutting for timber demand, fire, overgrazing by sheep and deer, and even deliberate clearance to deter wolves have all been factors in the decline of this once great pine and birch forest. Only comparatively small areas (17,000 ha, only just over 1% of the estimated original 1,500,000 ha) of this ancient forest remain, the main surviving remnants being at Abernethy Forest, Glen Affric, Rothiemurchus Forest, and the Black Wood of Rannoch. Plans are currently in progress to restore at least some areas and work has started at key sites.[*][4][*][8]

Additionally, the Scots pine is the plant badge of Clan Gregor and has been proposed as the national tree of Scotland

43.3 Cultivation and uses

Scots pine is an important tree in forestry. The wood is used for pulp and sawn timber products. A seedling stand can be created by planting, sowing, or natural regeneration. Commercial plantation rotations vary between 50 and 120 years, with longer rotations in northeastern areas where growth is slower.

In Scandinavian countries, Scots pine was used for making tar in the preindustrial age. Some active tar producers still exist, but mostly the industry has ceased.[*][8][*][9] The pine has also been used as a source of rosin and turpentine.

The wood is pale brown to red-brown, and used for general construction work. It has a dry density around 470 kg/m^3 (varying with growth conditions), an open porosity of 60%, a fibre saturation point of 0.25 kg/kg, and a saturation moisture content of 1.60 kg/kg.[*][9] Scots pine fibres are used to make the textile known as vegetable flannel,[*][20] which has a hemp-like appearance, but with a tighter, softer texture.[*][21]

Scots pine has also been widely planted in New Zealand and much of the colder regions of North America; it was one of the first trees introduced to North America, in about 1600.[*][22] It is listed as an invasive species in some areas there, including Ontario,[*][23] Michigan[*][24] and Wisconsin.[*][25] It has been widely used in the United States for the Christmas tree trade, and was one of the most popular Christmas trees from the 1950s through the 1980s. It remains popular for that usage, though it has been eclipsed in popularity, by such species as Fraser fir, Douglas-fir, and others. Despite its invasiveness in parts of eastern North America, Scots pine does not often grow well there, partly due to climate and soil differences between its native habitat and that of North America, and partly due to damage by pests and diseases; the tree often grows in a twisted, haphazard manner if not tended to (as they are in the Christmas tree trade).[*][3][*][26] Scots pines may be killed by the pine wood nematode, which causes pine wilt disease. The nematode most often attacks trees that are at least ten years old and often kills invaded trees within a few weeks.[*][27]

Several cultivars are grown for ornamental purposes in parks and large gardens, of which 'Beuvronensis'[*][28] has gained the Royal Horticultural Society's Award of Garden Merit.

43.4 Images

- Scots pine wood
- Bark on a mature *P. sylvestris* tree
- Looking up into the branch structure of a *P. sylvestris* tree

43.5 Names

In the past (before the 18th century), this species was more often known as “Scots fir” or “Scotch fir”.

Other names sometimes used include Riga pine and Norway pine, and Mongolian pine for var. *mongolica*. “Scotch pine” is another variant of the common name, used mostly in North America.[*][29]

Pinus sylvestris – *botanical plate*

Scots pine forest in Estonia

The timber from it is also called red deal or yellow deal.

Another name, although less common, is European redwood.*[30]

43.6 References

[1] Conifer Specialist Group (1998). *Pinus sylvestris*. 2006. *IUCN Red List of Threatened Species*. IUCN 2006. www.iucnredlist.org. Retrieved on 12 May 2006.

[2] Farjon, A. (2005). *Pines Drawings and Descriptions of the Genus Pinus* 2nd ed. Brill ISBN 90-04-13916-8.

[3] Gymnosperm Database: *Pinus sylvestris*

[4] Trees for Life: Species profile: Scots pine

[5] Mirov, N. T. (1967). *The Genus Pinus*. Ronald Press.

[6] Rushforth, Keith (1986) [1980]. *Bäume* [*Pocket Guide to Trees*] (in German) (2nd ed.). Bern: Hallwag AG. ISBN 3-444-70130-6.

[7] Laas, Eino (2004). *Okaspuud* (in Estonian). Tartu: Atlex. p. 208. ISBN 9985-9489-7-1.

[8] Steven, H. M., & Carlisle, A. (1959, facsimile reprint 1996). *The Native Pinewoods of Scotland*. Castlepoint Press.

[9] Pravdin, L. F. (1969). *Scots Pine. Variation, intraspecific Taxonomy and Selection*. Israel Program for Scientific Translations (originally published 1964 in Russian).

[10] Langlet, O. (1959). A Cline or not a Cline – a Question of Scots Pine. *Silvae Genetica* 8: 13–22.

[11] Kinloch, B. B., Westfall, R. D., & Forrest, G. I. (1986). Caledonian Scots Pine: Origins and Genetic Structure. *New Phytologist* 104: 703–729.

[12] Szmidt, A. E., & Wang, X-R. (1993). Molecular systematics and genetic differentiation of *Pinus sylvestris* (L.) and *P. densiflora* (Sieb. et Zucc.). *Theoret. Appl. Genet.* 86: 159–165.

[13] Prus-Glowacki, W., & Stephan, B. R. (1994). Genetic variation of Pinus sylvestris from Spain in Relation to Other European Populations. *Silvae Genetica* 43: 7–14.

[14] Goncharenko, G. G., Silin, A. E., & Padutov, V. E. (1995). Intra- and interspecific genetic differentiation in closely related pines from *Pinus* subsection *Sylvestres* (Pinaceae) in the former Soviet Union. *Pl. Syst. Evol.* 194: 39–54.

[15] Sinclair, W. T., Morman, J. D., & Ennos, R. A. (1999). The postglacial history of Scots pine (*Pinus sylvestris* L.) in western Europe: evidence from mitochondrial DNA variation. *Molec. Ecol.* 8: 83–88.

[16] Red Book of Russia. Pinus Sylvestris L. Var. Cretacea Kalenicz. Ex Kom

[17] Milner, Edward (2011). "Trees of Britain andIreland". *Flora*: 15 and 120.

[18] Carlisle, A., & Brown, A. H. F. (1968). Biological Flora of the British Isles: Pinus sylvestris L. *J. Ecol.* 56: 269–307.

[19] Edlin, H. L. (1970). *Trees, Woods and Man*, 3rd ed. Collins: New Naturalist.

[20] "Vegetable flannel". *Webster's 1913 Dictionary*. Webster. Retrieved 18 August 2014.

[21] Cole, George S. (1900). *Cole's Encyclopedia of Dry Goods*. Root Newspaper Association. p. 566.

[22] Moore, G., Kershner, B., Tufts, C., Mathews, D, Nelson, G., Spellenberg, R., Thieret, J. W., Purinton, T., & Block, A. (2008). *National Wildlife Federation Field Guide to Trees of North America*. New York: Sterling. p. 67. ISBN 1-4027-3875-7.

[23] "Invasive Ontario Plants". Protect Our Water and Environmental Resources. Retrieved 17 December 2011.

[24] "Species found in Michigan". *Early Detection and Distribution Mapping System*. Center for Invasive Species and Ecosystem Health at the University of Georgia. Retrieved 17 December 2011.

[25] "Terrestrial Invasives". *Invasive Species*. Wisconsin Department of Natural Resources. Retrieved 17 December 2011.

[26] Fire Effects Information System: *Pinus sylvestris*

[27] "Pine Wilt" (PDF). University of Missouri - Extension. Retrieved 6 November 2013.

[28] "RHS Plant Selector - *Pinus sylvestris* 'Beuvronensis'". Retrieved 27 May 2013.

[29] Germplasm Resources Information Network: *Pinus sylvestris*.

[30] Timber Trade Federation

43.7 External links

- Eichhorn, Markus (October 2011). "The Scots Pine". *Test Tube*. Brady Haran for the University of Nottingham.

Chapter 44

Populus

"Poplar" redirects here. For other uses, see Poplar (disambiguation) and Populus (disambiguation).
Not to be confused with *Liriodendron tulipifera* (tulip poplar), the source of poplar wood, or with the video game Populous.

Populus is a genus of 25–35 species of deciduous flowering plants in the family Salicaceae, native to most of the Northern Hemisphere. English names variously applied to different species include **poplar** /ˈpɒp.lər/, **aspen**, and **cottonwood**.

In the September 2006 issue of *Science Magazine*, the Joint Genome Institute announced that the Western Balsam Poplar (*P. trichocarpa*) was the first tree for which its full DNA code had been determined by DNA sequencing.*[2]

44.1 Description

The genus has a large genetic diversity, and can grow from anywhere between 15–50 m (49–164 ft) tall, with trunks of up to 2.5 m (8 ft 2 in) diameter.

The bark on young trees is smooth, white to greenish or dark grey, often with conspicuous lenticels; on old trees it remains smooth in some species, but becomes rough and deeply fissured in others. The shoots are stout, with (unlike in the related willows) the terminal bud present. The leaves are spirally arranged, and vary in shape from triangular to circular or (rarely) lobed, and with a long petiole; in species in the sections *Populus* and *Aigeiros*, the petioles are laterally flattened, so that breezes easily cause the leaves to wobble back and forth, giving the whole tree a "twinkling" appearance in a breeze. Leaf size is very variable even on a single tree, typically with small leaves on side shoots, and very large leaves on strong-growing lead shoots. The leaves often turn bright gold to yellow before they fall during autumn.*[3]*[4]

The flowers are mostly dioecious (rarely monoecious) and appear in early spring before the leaves. They are borne in long, drooping, sessile or pedunculate catkins produced from buds formed in the axils of the leaves of the previous year. The flowers are each seated in a cup-shaped disk which is borne on the base of a scale which is itself attached to the rachis of the catkin. The scales are obovate, lobed and fringed, membranous, hairy or smooth, usually caducous. The male flowers are without calyx or corolla, and comprise a group of 4–60 stamens inserted on a disk; filaments short, pale yellow; anthers oblong, purple or red, introrse, two-celled; cells opening longitudinally. The female flower also has no calyx or corolla, and comprises a single-celled ovary seated in a cup-shaped disk. The style is short, with 2–4 stigmas, variously lobed, and numerous ovules. Pollination is by wind, with the female catkins lengthening considerably between pollination and maturity. The fruit is a two to four-valved dehiscent capsule, green to reddish-brown, mature in mid summer, containing numerous minute light brown seeds surrounded by tufts of long, soft, white hairs which aid wind dispersal.*[3]*[5]

Male catkins of Populus × canadensis

44.2 Ecology

Poplars of the cottonwood section are often wetlands or riparian trees. The aspens are among the most important boreal broadleaf trees.*[3]

Poplars and aspens are important food plants for the larvae of a large number of Lepidoptera species - see List of Lepidoptera that feed on poplars. *Pleurotus populinus*, the aspen oyster mushroom, is found exclusively on dead wood of *Populus* trees in North America.

44.3 Classification

Group of four poplars on a hill through the seasons, April, September, October, February (Germany)

The genus *Populus* has traditionally been divided into six sections on the basis of leaf and flower characters;*[4]*[6] this classification is followed below. Recent genetic studies have largely supported this, confirming some previously suspected reticulate evolution due to past hybridisation and introgression events between the groups. Some species (noted below) had differing relationships indicated by their nuclear DNA (paternally inherited) and chloroplast DNA sequences (maternally inherited), a clear indication of likely hybrid origin.*[7] Hybridisation continues to be common in the genus, with several hybrids between species in different sections known.*[3]*[8]

44.3.1 Selected species

- ***Populus* section *Populus* – aspens and White Poplar.** Circumpolar subarctic and cool temperate, and mountains farther south (White Poplar warm temperate)
  - *Populus tremula* – aspen, common aspen, Eurasian aspen, European aspen, quaking aspen (Europe, northern Asia)
  - *Populus adenopoda* – Chinese Aspen (Eastern Asia)

Populus nigra *in autumn*

- *Populus alba* – White Poplar (Southern Europe to central Asia)
  - *Populus* × *canescens* (*P. alba* × *P. tremula*) – Grey Poplar
  - *Populus spp. X* (see "spp.") – Pacific Albus (North America)

- *Populus davidiana* – Korean Aspen (Eastern Asia)
- *Populus grandidentata* – Bigtooth Aspen (Eastern North America)
- *Populus sieboldii* – Japanese Aspen (Eastern Asia)
- *Populus tremuloides* – Quaking Aspen or Trembling Aspen (North America)

- ***Populus* section *Aigeiros* – black poplars, some of the cottonwoods.** North America, Europe, western Asia; temperate
  - *Populus deltoides* – Eastern Cottonwood (Eastern North America)
  - *Populus fremontii* – Fremont Cottonwood (Western North America)
  - *Populus nigra* – Black Poplar (Europe) Placed here by nuclear DNA; cpDNA places in sect. *Populus*. (Including *Populus afghanica*.)
    - *Populus* × *canadensis* (*P. deltoides* × *P. nigra*) – Hybrid Black Poplar
    - *Populus* × *inopina* (*P. nigra* × *P. fremontii*) – Hybrid Black Poplar

- ***Populus* section *Tacamahaca* – balsam poplars.** North America, Asia; cool temperate
  - *Populus angustifolia* – Willow-leaved Poplar or Narrowleaf Cottonwood (Central North America)
  - *Populus balsamifera* – Ontario Balsam Poplar (Northern North America) (= *P. candicans*, *P. tacamahaca*)
  - *Populus cathayana* – (Northeast Asia)
  - *Populus koreana* J.Rehnder – Korean Poplar (Northeast Asia)
  - *Populus laurifolia* – Laurel-leaf Poplar (Central Asia)
  - *Populus maximowiczii* A.Henry – Maximowicz' Poplar, Japanese Poplar (Northeast Asia)
  - *Populus simonii* – Simon's Poplar (Northeast Asia)
  - *Populus suaveolens* Fischer – Mongolian Poplar (Northeast Asia)
  - *Populus szechuanica* – Sichuan Poplar (Northeast Asia) Placed here by nuclear DNA; cpDNA places in sect. *Aigeiros*.
  - *Populus trichocarpa* – Western Balsam Poplar or Black Cottonwood (Western North America)
  - *Populus tristis* (Northeast Asia) Placed here by nuclear DNA; cpDNA places in sect. *Aigeiros*.
  - *Populus ussuriensis* – Ussuri Poplar (Northeast Asia)
  - *Populus yunnanensis* – Yunnan Poplar (East Asia)

- ***Populus* section *Leucoides* – necklace poplars or bigleaf poplars.** Eastern North America, eastern Asia; warm temperate
  - *Populus heterophylla* – Swamp Cottonwood (Southeastern North America)
  - *Populus lasiocarpa* – Chinese Necklace Poplar (Eastern Asia)
  - *Populus wilsonii* – Wilson's Poplar (Eastern Asia)

- ***Populus* section *Turanga* – subtropical poplars.** Southwest Asia, east Africa; subtropical to tropical
  - *Populus euphratica* – Euphrates Poplar (North Africa, Southwest and Central Asia)
  - *Populus ilicifolia* – Tana River Poplar (East Africa)

- ***Populus* section *Abaso* – Mexican poplars.** Mexico; subtropical to tropical
  - *Populus guzmanantlensis* (Mexico)
  - *Populus mexicana* – Mexico Poplar (Mexico)

Leaves of Populus lasiocarpa

44.4 Cultivation

Many poplars are grown as ornamental trees, with numerous cultivars used. They have the advantage of growing very big, very fast. Almost all poplars take root readily from cuttings or where broken branches lie on the ground (they also often have remarkable suckering abilities, and can form huge colonies from a single original tree - such as the famous *Pando* forest made of thousands of *Populus tremuloides* clones).

Trees with fastigiate (erect, columnar) branching are particularly popular, and are widely grown across Europe and southwest Asia. However, like willows, poplars have very vigorous and invasive root systems stretching up to 40 m from the trees; planting close to houses or ceramic water pipes may result in damaged foundations and cracked walls and pipes due to their search for moisture.

A simple, reproducible, high frequency micropropagation protocol in Eastern Cottonwood *Populus deltoides* has been reported by Yadav et al. 2009*[9]

44.4.1 India

In India, the poplar is grown commercially by farmers, mainly in the Punjab region. Common poplar varieties are:

- G48 (grown in the plains of Punjab, Haryana, UP)
- w22 (grown in mountainous regions, e.g., Himachal Pradesh, Pathankot, Jammu)

The trees are grown from *kalam* or cuttings, harvested annually in January and February, and commercially available up to 15 November.

Most commonly used to make plywood, Yamuna Nagar in Haryana state has a large plywood industry reliant upon poplar. It is graded according in sizes known as "over" (over 24 inches (610 mm)), "under" (18–24 inches (460–610 mm)), and "sokta" (less than 18 inches (460 mm)).

44.5 Uses

Although the wood from *Populus* is known as poplar wood, a common high-quality hardwood "poplar" with a greenish colour is actually from an unrelated genus *Liriodendron*. *Populus* wood is a lighter, more porous material.

Its flexibility and close grain make it suitable for a number of applications, similar to those for willow. The Greeks and Etruscans made shields of poplar, and Pliny also recommended poplar for this purpose.*[10] Poplar continued to be used for shield construction through the Middle Ages and was renowned for a durability similar to that of oak, but at a substantial reduction in weight.

44.5.1 Manufacturing

- In many areas, fast-growing hybrid poplars are grown on plantations for pulpwood
- Poplar is widely used for the manufacture of paper.*[11]
- It is also sold as inexpensive hardwood timber, used for pallets and cheap plywood; more specialised uses include matches and the boxes in which camembert cheese is sold.
- Poplar wood is also widely used in the snowboard industry for the snowboard core, because it has exceptional flexibility, and is sometimes used in the bodies of electric guitars and drums.
- Poplar wood, particularly when seasoned, makes a good hearth for a bow drill.
- Due to its high tannic acid content, the bark has been used in Europe for tanning leather.*[5]
- Poplar wood can be used to produce chopsticks or wooden shoes.

44.5.2 Energy

There is interest in using poplar as an energy crop for biomass or biofuel, in energy forestry systems, particularly in light of its high energy-in / energy-out ratio, large carbon mitigation potential and fast growth.

In the United Kingdom, poplar (as with fellow energy crop willow) is typically grown in a short rotation coppice system for two to five years (with single or multiple stems), then harvested and burned - the yield of some varieties can be as high as 12 oven dry tonnes per hectare every year*[12]

44.5.3 Art and literature

Poplar was the most common wood used in Italy for panel paintings; the Mona Lisa and most famous early renaissance Italian paintings are on poplar. The wood is generally white, often with a slightly yellowish colour.

Some stringed instruments are made with one-piece poplar backs; violas made in this fashion are said to have a particularly resonant tone. Similarly, though typically it is considered to have a less attractive grain than the traditional sitka spruce, poplar is beginning to be targeted by some harp luthiers as a sustainable and even superior alternative for their soundboards:*[13] in these cases another hardwood veneer is sometimes applied to the resonant poplar base both for cosmetic reasons, and supposedly to fine-tune the acoustic properties.

Two notable poems in English lament the cutting down of poplars, William Cowper's *The Poplar Field* and Gerard Manley Hopkins' *Binsey Poplars felled 1879*.

Abel Meeropol's poem Strange Fruit mentions poplar trees in the context of lynching.

44.5.4 Land management

Lombardy Poplars are used as a windbreak around agricultural fields to protect against wind erosion.

44.5.5 Agriculture

Logs from the poplar provide a growing medium for Shiitake mushrooms.*[14]

44.6 See also

- Poplar Walk, Christ Church Meadow, Oxford, England

44.7 References

[1] "Genus **Populus (poplars)**". *Taxonomy*. UniProt. Retrieved 4 February 2010.

[2] Joint Genome Institute, *Populus trichocarpa*

[3] Meikle, R. D. (1984). *Willows and Poplars of Great Britain and Ireland*. BSBI Handbook No. 4. ISBN 0-901158-07-0.

[4] Rushforth, K. (1999). *Trees of Britain and rope*. Collins ISBN 0-00-220013-9.

[5] Keeler, H. L. (1900). *Our Native Trees and How to Identify Them*. New York: Charles Scriber's Sons. pp. 410–412.

[6] Eckenwalder, J.E. (1996). "Systematics and evolution of *Populus*". In R.F. Stettler; H.D. Bradshaw; P.E. Heilman; T.M. Hinckley. *Biology of* Populus *and its implications for management and conservation*. Ottawa: NRC Research Press, National Research Council of Canada. ISBN 9780660165066.

[7] Hamzeh, M., & Dayanandan, S. (2004). Phylogeny of *Populus* (Salicaceae) based on nucleotide sequences of chloroplast TRNT-TRNF region and nuclear rDNA. *Amer. J. Bot.* 91: 1398-1408. Available online

[8] Eckenwalder, J.E. (2001). "Key to species and main crosses". In D.I. Dickmann; J.G. Isebrands; J.E. Eckenwalder; J. Richardson. *Poplar culture in North America*. Ottawa: NRC Research Press. pp. 325–330. ISBN 978-0-660-18145-5.

[9] http://www.springerlink.com/content/553472252334p7kq/fulltext.pdf

[10] The Cambridge Companion to Archaic Greece, p.69.

[11] Poplar cultivation in Europe

[12] Aylott, Matthew J.; Casella, E; Tubby, I; Street, NR; Smith, P; Taylor, G (2008). "Yield and spatial supply of bioenergy poplar and willow short-rotation coppice in the UK" (PDF). *New Phytologist* **178** (2 fvhc): 358–370. doi:10.1111/j.1469-8137.2008.02396.x. PMID 18331429. Retrieved 22 October 2008.

[13] Rees Harps Website, "Harp Myth #8".

[14] Shiitake growth studies performed by RMIT

Fastigiate Black Poplar cultivar of the Plantierensis Group, in Hungary

Poplars dominate the flora of Khorog City Park, GBAO, Tajikistan

Popular Populus *variety G48 in Punjab, India; Jhalli Farms Village Niara/Hoshiarpur*

Traditional Pamiri House

Rotor poplar and willow cuttings planter, planting a new nursery of poplar for biomass with short rotation

Chapter 45

Populus tremula

Not to be confused with *Populus tremuloides*, the American aspen, also called trembling aspen and quaking aspen

Populus tremula, commonly called **aspen**,[*][1] **common aspen**, **Eurasian aspen**, **European aspen**,[*][1][*][2] or **quaking aspen**,[*][1] is a species of poplar native to cool temperate regions of Europe and Asia, from Iceland[*][3] and the British Isles[*][4] east to Kamchatka, north to inside the Arctic Circle in Scandinavia and northern Russia, and south to central Spain, Turkey, the Tian Shan, North Korea, and northern Japan. It also occurs at one site in northwest Africa in Algeria. In the south of its range, it occurs at high altitudes in mountains.[*][5][*][6]

The English name *Waverly*, meaning "*quaking aspen*", is both a surname and unisex given name.

45.1 Description

It is a substantial deciduous tree growing to 20 m (66 ft) tall by 10 m (33 ft) broad, with a trunk up to 1 m (3 ft) in diameter. The bark is pale greenish-grey and smooth on young trees with dark grey diamond-shaped lenticels, becoming dark grey and fissured on older trees. The adult leaves, produced on branches of mature trees, are nearly round, slightly wider than long, 2–8 cm diameter, with a coarsely toothed margin and a laterally flattened petiole 4–8 cm long. The flat petiole allows them to tremble in even slight breezes, and is the source of its scientific name, as well as one of its vernacular names "langues de femmes" attributed to Gerard's 17th-century *Herball*. The leaves on seedlings and fast-growing stems of root sprouts are very different, heart-shaped to nearly triangular, and often much larger, up to 20 cm (8 in) long; their petiole is also less flattened. The flowers are wind-pollinated catkins produced in early spring before the new leaves appear; they are dioecious, with male and female catkins on different trees. The male catkins are patterned green and brown, 5–10 cm long when shedding pollen; the female catkins are green, 2–4 cm long at pollination, maturing in early summer to bear 10–20 capsules each containing numerous tiny seeds embedded in downy fluff. The fluff assists wind dispersal of the seeds when the capsules split open at maturity.[*][2][*][5]

It can be distinguished from the closely related North American *Populus tremuloides* by the leaves being more coarsely toothed.[*][5]

Like other aspens, it spreads extensively by root sprouts, which may be produced up to 40 m from the parent tree, forming extensive clonal colonies.[*][2][*][5]

45.2 Ecology

It is a very hardy species and tolerates long, cold winters and short summers.

Aspen is resistant to browsing pressure by fallow deer due to its unpleasant taste.[*][7]

Adult (left) and juvenile (right) leaves

45.3 Cultivation

The aspen is found in cultivation in parks and large gardens.*[8]

The hybrid with *Populus alba* (white poplar), known as grey poplar, *Populus* × *canescens*, is widely found in Europe and central Asia. Hybrids with several other aspens have also been bred at forestry research institutes in order to find trees with greater timber production and disease resistance (e.g. *P. tremula* × *P. tremuloides*, bred in Denmark*[9]).

45.4 References

[1] "USDA GRIN".

[2] Trees for Life Species Profile: Aspen

[3] "Blæösp (Populus tremula)_Vísindavefurinn".

[4] James Kilkelly Irish native Aspen tree

[5] Rushforth, K. (1999). *Trees of Britain and Europe*. Collins ISBN 0-00-220013-9.

[6] Den Virtuella Floran: *Populus tremula* (in Swedish; with maps)

[7] Rackham, Oliver (1994). *The Illustrated History of the Countryside*. London : BCA. CN 2922.p. 64.

[8] "RHS Plant Selector - *Populus tremula*". Retrieved 28 May 2013.

[9] Jensen, N. (1994). Guide til Arboretet i Hørsholm (in Danish).

Populus tremula *growing well north of the Arctic Circle in Norway; April 2008.*

45.5 Further reading

- Kuusinen, Mikko. "Epiphytic lichen flora and diversity on Populus tremula in old-growth and managed forests of southern and middle boreal Finland", Annales Botanici Fennici. Vol. 31. No. 4. 1994.

45.6 External links

Chapter 46

Populus nigra

Populus nigra, the **black poplar**, is a species of cottonwood poplar, the type species of section *Aigeiros* of the genus *Populus*, native to Europe, southwest and central Asia, and northwest Africa.*[1]

It is a medium-sized to large deciduous tree, reaching 20–30 m (rarely 40 m) tall, with a trunk up to 1.5 m diameter, though some old individuals have grown much bigger (more than 3 meters DBH for several trees in France). The leaves are diamond-shaped to triangular, 5–8 cm long and 6–8 cm broad, green on both surfaces.*[2] The species is dioecious (male and female flowers on different plants), with flowers in catkins and pollination by wind. The black poplar grows in low-lying areas of moist ground.*[3]

There are three subspecies, some botanists distinguishing a fourth:*[1]*[2]

- *Populus nigra* subsp. *nigra*. Central and eastern Europe. Leaves and shoots glabrous (hairless); bark grey-brown, thick and furrowed.
- *Populus nigra* subsp. *betulifolia* (Pursh) W.Wettst. North-west Europe (France, Great Britain, Ireland). Leaf veins and shoots finely downy; bark grey-brown, thick and furrowed, often with heavy burrs, trunk usually heavily leaning.
- *Populus nigra* subsp. *caudina* (Ten.) Bugała. Mediterranean region, also southwest Asia if var. *afghanica* not distinguished.
- *Populus nigra* var. *afghanica* Aitch. & Hemsl. (syn. *P. nigra* var. *thevestina* (Dode) Bean). Southwest Asia; treated as a cultivar of *P. nigra* by many botanists,*[4] and as a distinct species *P. afghanica* by others;*[5] bark smooth, nearly white; leaves and shoots as subsp. *caudina* (see also cultivars, below).

The subspecies *betulifolia* is one of the rarest trees in Great Britain and Ireland,*[6]*[7] with only about 7,000 trees known, of which only about 600 have been confirmed as female.*[8]

Several cultivars have also been selected, these being propagated readily by cuttings:

- 'Italica'. The true Lombardy poplar, selected in Lombardy, northern Italy, in the 17th century. The growth is fastigiate (having the branches more or less parallel to the main stem), with a very narrow crown. Coming from the Mediterranean region, it is adapted to hot, dry summers and grows poorly in humid conditions, being short-lived due to fungal diseases. It is a male clone.*[9]

As a widely selected species chosen by golf architects in the 1960s, it soon became apparent that the Poplar's very invasive roots destroyed land drainage systems. Decades later the same courses were removing Poplars stands wholesale. At around 40 to 50 years this short lived variety starts shedding branches and are very likely to be blown over in high winds, each successive tree lost exposing neighbouring trees creating a domino effect.

- *Plantierensis* group. A group of clones derived by crossing 'Italica' with *P. nigra* ssp *betulifolia* at the Plantières Nursery near Metz in France in 1884; they are similar to 'Italica' (and often mistaken for it) but with a slightly broader crown, and better adapted to the cool, humid climate of northwest Europe, where the true Lombardy poplar does not grow well. Both male and female clones are grown. This is the tree most commonly grown in Great Britain and Ireland as "Lombardy poplar".*[9]

Burrs and normal bark on a black poplar tree (subspecies betulifolia*) in Ayrshire, Scotland.*

- 'Manchester Poplar'. A cultivar of subsp. *betulifolia* widely planted in northwest England. It is a male clone, and currently seriously threatened by Poplar Scab disease.*[10]*[11]
- 'Gigantea'. Another fastigiate clone, of unknown origin, with a rather broader, more vigorous crown than 'Italica'. It is a female clone.*[9]
- 'Afghanica' (syn. 'Thevestina'). Most, if not all, specimens of the variety 'Afghanica' are of a single clone, and many botanists therefore treat it as a cultivar rather than a botanical variety. It is fastigiate, similar to 'Italica',

but with a striking whitish bark; it also differs from 'Italica' in being a female clone. This is the common fastigiate poplar in southwest Asia and southeast Europe (the Balkans), where it was introduced during the Ottoman Empire period.*[9]

46.1 See also

- The Green Cathedral

46.2 References

[1] Flora Europaea: *Populus nigra*

[2] Rushforth, K. (1999). *Trees of Britain and Europe*. Collins ISBN 0-00-220013-9.

[3] "Black Poplar". *The Woodland Trust*. Retrieved July 12, 2014.

[4] Germplasm Resources Information Network: *Populus nigra* var. *thevestina*

[5] Flora of Pakistan: *Populus afghanica*

[6] Milne-Redhead, E. (1990). The B.S.B.I. Black Poplar survey, 1973-88. *Watsonia* 18: 1-5. Available online (pdf file).

[7] Arkive: *Populus nigra*

[8] Cooper, Fiona (2006). *The Black Poplar: Ecology, History and Conservation*. Windgather Press ISBN 1-905119-05-4

[9] Bean, W. J. (1980). *Trees and Shrubs Hardy in the British Isles* Vol. 3. John Murray ISBN 0-7195-2427-X

[10] Stace, C. A. (1971). The Manchester Poplar. *Watsonia* 8: 391-393.

[11] Arboricultural Information Exchange: Manchester Poplar Disease

46.3 External links

- A. Vanden Broeck (2003), *Black poplar (Populus nigra)*, EUFORGEN Technical Guidelines for genetic conservation and use, EUFORGEN's Populus nigra Network and Bioversity International's Regional Office for Europe
- (French) Conservation of genetic resources of *Populus nigra*

A fastigiate black poplar cultivar of the Plantierensis *Group, in Hungary*

Poplar seed tufts

Chapter 47

Rowan

For other uses, see Rowan (disambiguation).
"Quicken Tree" redirects here. For the racehorse, see Quicken Tree (horse).

The **rowans** or **mountain-ashes** are shrubs or trees in genus *Sorbus* of family Rosaceae. They are native throughout the cool temperate regions of the Northern Hemisphere, with the highest species diversity in the mountains of western China and the Himalaya, where numerous apomictic microspecies occur.*[1] The name *rowan* was originally applied to the species *Sorbus aucuparia*, and is also used for other species in *Sorbus* subgenus *Sorbus*.*[2] Rowans are unrelated to the true ash trees, which belong to the genus *Fraxinus*, family Oleaceae, though their leaves bear superficial similarity.

Formerly, when a wider variety of fruits were commonly eaten in European and North American culture, *Sorbus* counted among the home fruits, though *Sorbus domestica* is all but extinct in Britain, where it was traditionally revered.*[3] Natural hybrids, often including *Sorbus aucuparia* and the whitebeam, *Sorbus aria*, give rise to many endemic variants in the UK.*[4]

47.1 Names

The traditional names of the rowan are those applied to the species *Sorbus aucuparia*, *Sorbus torminalis* (wild service-tree), and *Sorbus domestica* (true service-tree). The Latin name *sorbus* was loaned into Old English as *syrfe*. The name "service-tree" for *Sorbus domestica* is derived from that name by folk etymology. The Latin name *sorbus* is from a root for "red, reddish-brown" (PIE **sor-/*ser-*); English *sorb* is attested from the 1520s in the sense "fruit of the service tree", adopted via French *sorbe* from Latin *sorbum* "service-berry". *Sorbus domestica* is also known as "Whitty Pear", the adjective *whitty* meaning "pinnate". The name "mountain-ash" for *Sorbus domestica* is due to a superficial similarity of the rowan leaves to those of the ash; not to be confused in *Fraxinus ornus*, a true ash that is also known as "mountain ash".*[5] *Sorbus torminalis* is also known as "chequer tree"; its fruits, formerly used to flavour beer, being called "chequers", perhaps from the spotted pattern of the fruit.

The name *rowan* is recorded from 1804, detached from an earlier *rowan-tree, rountree*, attested from the 1540s in northern English and Scottish. It is from a North Germanic source (such as Middle Norwegian), derived from Old Norse *reynir* (c.f. Norwegian *rogn*, Swedish *rönn*), ultimately from the Germanic verb **raud-inan* "to redden", in reference to the berries (as is the Latin name *sorbus*). Various dialectal variants of *rowan* are found in English, including *ran, roan, rodan, royan, royne, round, rune*.

The Old English name of the rowan is *cwic-beám*, which survives in the name *quickbeam* (also *quicken*, *quicken-tree*, and variants). This name by the 19th-century was reinterpreted as connected to the word *witch*, from a dialectal variant *wick* for *quick* and names such as *wicken-tree, wich-tree, wicky, wiggan-tree*, giving rise to names such as *witch-hazel*[6] and *witch-tree*.*[7]

The Old Irish name is *cairtheand*, reflected in Modern Irish *caorann*. The "arboreal" *Bríatharogam* in the *Book of Ballymote* associates the rowan with the letter *luis*, with the gloss "delightful to the eye (*li sula*) is *luis*, i.e. rowan (*caertheand*), owing to the beauty of its berries". Due to this, "delight of the eye" (vel sim.) has been reported as a "name of the rowan" by some commentators.

In the Canadian provinces of Newfoundland and Labrador and Nova Scotia, this species is commonly referred to as a "dogberry" tree.*[8] In German, *Sorbus aucuparia* is known as the *Vogelbeerbaum* ("bird-berry-tree") or as *Eberesche*. The latter is a compound of the name of the ash tree (*Esche*) with what is contemporarily the name of the boar (*Eber*) but in fact the continuation of a Gaulish name, *eburo-* (also the name for a dark reddish-brown colour, cognate with Greek *orphnos*, Old Norse *iarpr* "brown"); like *sorbus*, *eburo-* seems to have referred to the colour of the berries; it is also recorded as a Gaulish name for the yew (which also has red berries), see also *Eburodunum (disambiguation)*. The Welsh name *Criafol* refers to the tree as "lamenting fruit" , associating the red fruit with the blood of Christ; as Welsh tradition believed the Cross was carved from the wood of this tree.

47.2 Botany

White-fruited Rowan Sorbus glabrescens*, a Chinese species with white fruit*

Rowans are mostly small deciduous trees 10–20 m tall, though a few are shrubs. The leaves are arranged alternately, and are pinnate, with (7–)11–35 leaflets; a terminal leaflet is always present. The flowers are borne in dense corymbs; each flower is creamy white, and 5–10 mm across with five petals. The fruit is a small pome 4–8 mm diameter, bright orange or red in most species, but pink, yellow or white in some Asian species. The fruit are soft and juicy, which makes them a very good food for birds, particularly waxwings and thrushes, which then distribute the rowan seeds in their droppings.*[1] Due to their small size the fruits are often referred to as berries, but a berry is a simple fruit produced from a single ovary, whereas a pome is an accessory fruit.

Rowan is used as a food plant by the larvae of some Lepidoptera species; see Lepidoptera that feed on *Sorbus*.

The best-known species is the European Rowan *Sorbus aucuparia*, a small tree typically 4–12 m tall growing in a variety of habitats throughout northern Europe and in mountains in southern Europe and southwest Asia. Its berries are a favourite food for many birds and are a traditional wild-collected food in Britain and Scandinavia. It is one of the hardiest European trees, occurring to 71° north in Vardø in Arctic Norway, and has also become widely naturalised in northern North America.

The greatest diversity of form as well as the largest number of Rowan species is in Asia, with very distinctive species

Mature European Rowan tree

such as Sargent's Rowan *Sorbus sargentiana* with large leaves 20–35 cm long and 15–20 cm broad and very large corymbs with 200–500 flowers, and at the other extreme, Small-leaf Rowan *Sorbus microphylla* with leaves 8–12 cm long and 2.5–3 cm broad. While most are trees, the Dwarf Rowan *Sorbus reducta* is a low shrub to 50 cm tall. Several of the Asian species are widely cultivated as ornamental trees.

North American native species in the subgenus *Sorbus (Sorbus)* include the American mountain-ash *Sorbus americana* and Showy mountain-ash *Sorbus decora* in the east and Sitka mountain-ash *Sorbus sitchensis* in the west.

Numerous hybrids, mostly behaving as true species reproducing by apomixis, occur between rowans and whitebeams; these are variably intermediate between their parents but generally more resemble whitebeams and are usually grouped with them (q.v.).

47.3 Selected species

- *Sorbus alnifolia*, Korean whitebeam
- *Sorbus amabilis*
- *Sorbus americana*, American mountain-ash
- *Sorbus aucuparia*, European rowan
- *Sorbus californica*
- *Sorbus cashmiriana*, Kashmir rowan
- *Sorbus commixta*, Japanese rowan
- *Sorbus decora*, Showy mountain-ash
- *Sorbus esserteauiana*, Esserteau's rowan

Rowan flowers

- *Sorbus fosteri*
- *Sorbus fruticosa*
- *Sorbus glabrescens*, White-fruited rowan
- *Sorbus harrowiana*, Harrow rowan
- *Sorbus hupehensis*, Hubei rowan
- *Sorbus insignis*
- *Sorbus khumbuensis*
- *Sorbus koehneana*
- *Sorbus lanata*
- *Sorbus matsumurana*
- *Sorbus maderensis*, Madeira rowan
- *Sorbus microphylla*, Small-leaf rowan
- *Sorbus oligodonta*, Kite-leaf rowan
- *Sorbus pallescens*
- *Sorbus pekinensis*
- *Sorbus pinnatifida*
- *Sorbus pluripinnata*

- *Sorbus pohuashanensis*
- *Sorbus pontica*
- *Sorbus poteriifolia*
- *Sorbus prattii*
- *Sorbus pseudovilmorinii*
- *Sorbus pygmaea*
- *Sorbus randaiensis*
- *Sorbus redliana*
- *Sorbus reducta*, Dwarf rowan
- *Sorbus rehderiana*
- *Sorbus retroflexis*
- *Sorbus rockii*
- *Sorbus rotundifolia*
- *Sorbus rufo-ferruginea*
- *Sorbus rufopilosa*, Tsema rowan
- *Sorbus sargentiana*, Sargent's rowan
- *Sorbus scalaris*, Ladder rowan
- *Sorbus scopulina*, Greene mountain-ash (var. scopulina) or Cascade mountain-ash (var. cascadensis)
- *Sorbus simonkaiana*
- *Sorbus sitchensis*, Sitka mountain-ash
- *Sorbus stankovii*
- *Sorbus taurica*
- *Sorbus ursina*
- *Sorbus vertesensis*
- *Sorbus vestita*
- *Sorbus vilmorinii*, Vilmorin's rowan
- *Sorbus wardii*
- *Sorbus wilfordii*

47.4 Uses

Rowans are excellent small ornamental trees for parks, gardens and wildlife areas. Several of the Chinese species, such as White-fruited rowan (*Sorbus glabrescens*) are popular for their unusual fruit colour, and Sargent's rowan (*Sorbus sargentiana*) for its exceptionally large clusters of fruit. Numerous cultivars have also been selected for garden use, several of them, such as the yellow-fruited *Sorbus* 'Joseph Rock', of hybrid origin.*[1] They are very attractive to fruit-eating birds, which is reflected in the old name "bird catcher".

The wood is dense and used for carving and turning and for tool handles and walking sticks.*[9] Rowan fruit are a traditional source of tannins for mordanting vegetable dyes.*[10] In Finland, it has been a traditional wood of choice for horse sled shafts and rake spikes.

The fruit of European Rowan (*Sorbus aucuparia*) can be made into a slightly bitter jelly which in Britain is traditionally eaten as an accompaniment to game, and into jams and other preserves, on their own, or with other fruit. The fruit can also be a substitute for coffee beans, and have many uses in alcoholic beverages: to flavour liqueurs and cordials, to produce country wine, and to flavour ale. In Austria a clear rowan schnapps is distilled which is called by its German name *Vogelbeerschnaps*. Czechs also make a Rowan liquor called *jeřabinka*[*][11] and the Welsh used to make one called *diodgriafel*.*[12]

Rowan cultivars with superior fruit for human food use are available but not common; mostly the fruits are gathered from wild trees growing on public lands.

Rowan fruit contains sorbic acid, an acid that takes its name from the Latin name of the genus *Sorbus*. The raw fruit also contain parasorbic acid (about 0.4%−0.7% in the European rowan*[13]), which causes indigestion and can lead to kidney damage, but heat treatment (cooking, heat-drying etc.) and, to a lesser extent, freezing, neutralises it, by changing it to the benign sorbic acid. Luckily, they are also usually too astringent to be palatable when raw. Collecting them after first frost (or putting in the freezer) cuts down on the bitter taste as well.

47.5 Mythology and folklore

The European rowan (*Sorbus aucuparia*) has a long tradition in European mythology and folklore. It was thought to be a magical tree and give protection against malevolent beings.*[14] The tree was also called "wayfarer's tree" or "traveller's tree" because it supposedly prevents those on a journey from getting lost.*[15] It was said in England that this was the tree on which the Devil hanged his mother. *[16]

British folklorists of the Victorian era reported the folk belief in apotropaic powers of the rowan-tree, in particular in the warding off of witches. Such a report is given by Edwin Lees (1856) for the Wyre Forest in the English West Midlands.*[17] Sir James Frazer (1890) reported such a tradition in Scotland, where the tree was often planted near a gate or front door.*[18] According to Frazer, birds' droppings often contain rowan seeds, and if such droppings land in a fork or hole where old leaves have accumulated on a larger tree, such as an oak or a maple, they may result in a rowan growing as an epiphyte on the larger tree. Such a rowan is called a "flying rowan" and was thought of as especially potent against witches and their magic, and as a counter-charm against sorcery.*[19] In 1891, Charles Godfrey Leland also reported traditions of rowan's apotropaic powers against witches in English folklore, citing the *Denham Tracts* (collected between 1846 and 1859).*[20]

In Norse mythology, the goddess Sif is the wife of the thunder god Thor. Sif has been linked with Ravdna, the consort of the Sami thunder-god Horagalles. Red berries of rowan were holy to Ravdna, and the name *Ravdna* resembles North Germanic words for the tree (for example, Old Norse *reynir*). According to *Skáldskaparmál* the rowan is called "the salvation of Thor" because Thor once saved himself by clinging to it. It has been theorized that Sif was once conceived in the form of a rowan to which Thor clung.*[21]

In Celtic and Druid mythology, the Rowan was known as the Portal Tree. It was also considered the threshold, between this world and otherworld, or between here and where ever you may be going, for example, it was placed at the gate to a property, signifying the crossing of the threshold between the path or street and the property of someone. According to Elen Sentier, in her book, *[22] "Threshold is a place of both INGRESS (the way in) and EGRESS (the way out). Rowan is a portal , threshold tree offering you the chance of 'going somewherere ... and leaving somewhere." *[23]

In Newfoundland, popular folklore maintains that a heavy crop of fruit means a hard or difficult winter. Similarly, in Finland and Sweden, the number of fruit on the trees was used as a predictor of the snow cover during winter, but here the belief was that the rowan "will not bear a heavy load of fruit and a heavy load of snow in the same

year" , that is, a heavy fruit crop predicted a winter with little snow. However, as fruit production for a given summer is related to weather conditions the previous summer, with warm, dry summers increasing the amount of stored sugars available for subsequent flower and fruit production, it has no predictive relationship to the weather of the next winter.*[24]*[25] Contrary to the above, in Malax, Finland the opposite was thought.*[26] If the rowan flowers were plentiful then the rye harvest would also be plentiful. Similarly, if the rowan flowered twice in a year there would be many potatoes and many weddings that autumn. And in Sipoo people are noted as having said that winter had begun when the waxwings (*Bombycilla garrulus*) had eaten the last of the rowan fruit.*[27] In Sweden, it was also thought that if the rowan trees grew pale and lost color, the fall and winter would bring much illness.*[28]

47.6 See also

Sorbus subgenus *Aria*
Sorbus subgenus *Micromeles*
Sorbus subgenus *Cormus*
Sorbus subgenus *Torminaria*
Sorbus subgenus *Chamaemespilus*

47.7 References

[1] Rushforth, K. (1999). *Trees of Britain and Europe*. Collins ISBN 0-00-220013-9.

[2] McAllister, H.A. 2005. *The genus Sorbus: Mountain Ash and other Rowans* . Kew Publishing.

[3] "The Whitty Pear, *Sorbus domestica*"

[4] Cambridge Botanic Garden: the Genus Sorbus

[5] "The similarities in the physical characteristics of all three types of tree [viz., *Fraxinus excelsior, Fraxinus ornus* and *Sorbus aucuparia*] are pervasive enough that they are confused not only in folk terminology but also in botanical nomenclature" . Richard Stoll Shannon (1975). *The Arms of Achilles and Homeric Compositional Technique* Volume 36 of *Mnemosyne*, (Brill), p. 41. The English herbalist John Gerard in 1590 apparently fell victim to just this confusion, equating *ornus* and *quickbeam* (see below).

[6] "Witch-hazel" is much more commonly associated with *Hamameles*.

[7] Abram Smythe Palmer, *Folk-etymology : a Dictionary of Verbal Corruptions Or Words Perverted in Form Or Meaning, by False Derivation Or Mistaken Analogy* (1882), 443f.

[8] Story, G. M. and Kirwin, W. J. (1990). *Dictionary of Newfoundland English*. University of Toronto Press. ISBN 0-8020-6819-7.

[9] Vedel, H., & Lange, J. (1960). *Trees and Bushes in Wood and Hedgerow*. Metheun & Co. Ltd., London.

[10] Henderson, Robert K. (2000). *The Neighbourhood Forager: A Guide For The Wild Food Gourmet*. Toronto: Key Porter Books. p. 68. ISBN 1-55263-306-3.

[11] Sorbier des oiseleurs

[12] Wild Food School

[13] O Raspe, C Findlay, AL Jacquemart. *Sorbus aucuparia L.* The Journal of Ecology, 2000

[14] Trees for Life: Mythology and Folklore of the Rowan

[15] Eyers, Jonathan (2011). *Don't Shoot the Albatross!: Nautical Myths and Superstitions*. A&C Black, London, UK. ISBN 978-1-4081-3131-2.

[16] Westwood, Jennifer (1985), *Albion. A Guide to Legendary Britain*. London: Grafton Books. ISBN 0-246-11789-3. p. 257.

[17] Edwin Lees, *Pictures of nature in the silurian region around the Malvern hills and vale of Severn*, H.W. Lamb, 1856, 274f.

[18] Sir James Frazer, The Golden Bough, p620, Papermac Edition, 1987, ISBN 0-333-43430-7

[19] Sir James Frazer, The Golden Bough, p702, Papermac Edition, 1987, ISBN 0-333-43430-7

[20] "The anti-witch rhyme used in Tweedesdale some sixty or seventy years ago [viz. in the 1820s] was: "Black-luggie, lammer bead, rowan-tree and reed thread, put the witches to their speed. [...] I have seen a twig of rowan-tree [...] which had been gathered on the second of May (observe this), wound round with some dozens of yards of red thread, placed visible in the window to act as a charm in keeping witches and *Boggle boes* from the house." Charles Godfrey Leland, *Gypsy Sorcery and Fortune Telling*, 1891, p. 198

[21] Turville-Petre, E. O. G. (1964). *Myth and Religion of the North: The Religion of Ancient Scandinavia*, p. 98. Weidenfeld and Nicolson.

[22] Shaman Pathways - Trees of the Goddess

[23] Sentier, Elen (2014). *Shaman Pathways - Trees of the Goddess.* Alresford, Hants,SO24 9JH, UK: Moon Books. ISBN 978 1 78279 332 8.

[24] Kobro, S., Søreide, L., Djønne, E., Rafoss, T., Jaastad, G., & Witzgall, P. (2003). Masting of rowan Sorbus aucuparia L. *Population Ecology* 45 (1): 25-30.

[25] Raspe, O., Findlay, C., & Jacquemart, A. (2000). Sorbus aucuparia. *Journal of Ecology* 88 (5): 910-930.

[26] Tillhagen, Carl-Herman. (1995). Skogarna och träden: Naturvård i gångna tider. Carlssons bokförlag, Stockholm.

[27] Mannhardt, Wilhelm. (1963). Wald- und Feldkulte. Bd. I. Der Baumkultus der Germanen und ihrer Nachbarstämmes. p. 52. Wissenschaftliche Buchgesellschaft Verlag

[28] Tillhagen, Carl-Herman. (1995). Skogarna och träden: Naturvård i gånga tider. Carlssons bokförlag, Stockholm

47.8 External links

- Rowan (Sorbus aucuparia) in "The Complete Pagan Herbal" by Anna Franklin (merciangathering.com)

Chapter 48

Whitebeam

The **whitebeams** are members of the Rosaceae family, comprising subgenus *Aria* of genus *Sorbus*, and hybrids involving species of this subgenus and members of subgenera *Sorbus*, *Torminaria* and *Chamaemespilus*. They are deciduous trees with simple or lobed leaves, arranged alternately. They are related to the rowans (*Sorbus* subgenus *Sorbus*), and many of the endemic restricted-range apomictic microspecies of whitebeam in Europe are thought to derive from hybrids between *S. aria* and the European rowan *S. aucuparia*; some are also thought to be hybrids with the wild service tree *S. torminalis*, notably the service tree of Fontainebleau *Sorbus latifolia* in French woodlands.

The best known species is the **common whitebeam** *Sorbus aria*, a columnar tree which grows to 25 m (82 ft) tall by 10 m (33 ft) broad, with clusters of white flowers in spring followed by speckled red berries in autumn (fall).*[1]

48.1 Appearance

The surface of the leaf is an unremarkable mid-green, but the underside is almost white (hence the name) transforming the appearance of the tree in strong winds, as noted by the poet Meredith: "flashing as in gusts the sudden-lighted whitebeam".*[2] It is also described as the "wind-beat whitebeam" in Gerard Manley Hopkins' poem "The Starlight Night".*[3]

48.2 Ecology

The berries are a favourite of birds, though less palatable (drier, less juicy) than rowan berries. Whitebeams are sometimes used as larval food plants by Lepidoptera species including Short-cloaked Moth.

48.3 Uses

This tree is grown in parks and large gardens. The cultivars *S. aria* 'Lutescens'*[4] and *S. aria* 'Majestica'*[5] have gained the Royal Horticultural Society's Award of Garden Merit.

The tough, hard wood is a deep orange when wet, and pale yellow after drying. It suited for woodturning, furniture, tool handles, and cogs before the use of iron.

48.4 Classification

- section *Aria* - *Sorbus aria* and its close relatives
- section *Alnifoliae* - a group of Asian species
- section *Thibeticae* - a group of species from the Himalayas and southern China
- *Sorbus intermedia* group (nothosubgenus *Soraria*) - taxa of hybrid origin involving sections *Aria* and *Sorbus*

A cross-section of a whitebeam branch

- *Sorbus latifolia* group (nothosubgenus *Tormaria*) - taxa of hybrid origin involving sections *Aria* and *Torminaria*

48.5 Selected species

Sorbus* subgenus *Aria

- *Sorbus admonitor* - No Parking Whitebeam
- *Sorbus alnifolia* - Korean Whitebeam
- *Sorbus anglica* - English Whitebeam
- *Sorbus aria* - Common Whitebeam
- *Sorbus aronioides* - Chokeberry-leaved Whitebeam
- *Sorbus arranensis* - Arran Whitebeam
- *Sorbus austriaca*
- *Sorbus bristoliensis* - Bristol Gorge Whitebeam
- *Sorbus cambrensis* - Welsh Whitebeam
- *Sorbus carpatica* - Carpathian Whitebeam
- *Sorbus cheddarensis* - Cheddar Whitebeam
- *Sorbus croceocarpa* - Orange Whitebeam

- *Sorbus cuneifolia* - Llangollen Whitebeam
- *Sorbus danubialis*
- *Sorbus decipiens* - Sharp-toothed Whitebeam
- *Sorbus devoniensis* - Devon Whitebeam
- *Sorbus eminens* - Round-leaved Whitebeam
- *Sorbus eminentiformis* - Doward Whitebeam
- *Sorbus eminentoides* - Twin Cliffs Whitebeam
- *Sorbus folgneri* - Folgner's Whitebeam
- *Sorbus franconica*
- *Sorbus graeca* - Balkan Whitebeam
- *Sorbus hibernica* - Irish Whitebeam
- *Sorbus hybrida* - Finnish Whitebeam, Swedish Service-Tree
- *Sorbus intermedia* - Swedish Whitebeam
- *Sorbus lancastriensis* - Lancastrian Whitebeam
- *Sorbus latifolia* - Service Tree of Fontainebleau
- *Sorbus leighensis* - Leigh Woods Whitebeam
- *Sorbus leptophylla* - Thin-leaved Whitebeam
- *Sorbus leyana* - Ley's Whitebeam
- *Sorbus margaretae* - Margaret's Whitebeam
- *Sorbus minima* - Least Whitebeam
- *Sorbus mougeotii* - Vosges Whitebeam
- *Sorbus parviloba* - Ship Rock Whitebeam
- *Sorbus porrigentiformis* - Grey-leaved Whitebeam
- *Sorbus pseudofennica* - Arran Service Tree
- *Sorbus pseudomeinichii* - False Rowan
- *Sorbus rupicola* - Rock Whitebeam
- *Sorbus rupicoloides* - Gough's Rock Whitebeam
- *Sorbus saxicola* - Symonds Yat Whitebeam
- *Sorbus scannelliana* - Scannell's Whitebeam
- *Sorbus stenophylla* - Llanthony Whitebeam
- *Sorbus stirtoniana* - Stirton's Whitebeam
- *Sorbus subcuneata* - Somerset Whitebeam
- *Sorbus thibetica* - Tibetan Whitebeam
- *Sorbus umbellata*
- *Sorbus vestita* - Himalayan Whitebeam
- *Sorbus vexans* - Bloody Whitebeam

- *Sorbus whiteana* - White's Whitebeam
- *Sorbus wilmottiana* - Wilmott's Whitebeam

Plus many other species

- ***Sorbus* subgenus *Sorbus***
- ***Sorbus* Other subgenera**

48.6 References

[1] *RHS A-Z encyclopedia of garden plants*. United Kingdom: Dorling Kindersley. 2008. p. 1136. ISBN 1405332964.

[2] Meredith, G. (1851). Love in the valley. Line 207. *Poems*

[3] Hopkins, Gerard Manley (1918). The starlight night. Line 6.

[4] "RHS Plant Selector - *Sorbus aria* 'Lutescens'". Retrieved 4 June 2013.

[5] "RHS Plant Selector - *Sorbus aria* 'Majestica'". Retrieved 4 June 2013.

Chapter 49

Sorbus aucuparia

Sorbus aucuparia, more commonly called **rowan** and **mountain-ash** (although the latter name may be used for several other unrelated trees), is a species of deciduous tree or shrub in the rose family. It is a highly variable species, and botanists have used different definitions of the species to include or exclude trees native to certain areas; a recent definition*[1] includes trees native to most of Europe and parts of Asia, as well as northern Africa. The range extends from Madeira and Iceland to Russia and northern China. Unlike many plants with similar distributions, it is not native to Japan.*[1]

S. aucuparia has a slender trunk with smooth bark, a loose and roundish crown, and its leaves are pinnate in pairs of leaflets on a central vein with a terminal leaflet. It blossoms from May to June in dense corymbs of small yellowish white flowers and develops small red pomes as fruit that ripen from August to October and are eaten by many bird species. The plant is undemanding and frost hardy and colonizes disrupted and inaccessible places as a short-lived pioneer species.

Fruit and foliage of *S. aucuparia* have been used by humans in the creation of dishes and beverages, as a folk medicine, and as fodder for livestock. Its tough and flexible wood has traditionally been used for woodworking. It is planted to fortify soil in mountain regions or as an ornamental tree and has several cultivars.

49.1 Names

Main article: Rowan § Names

The binomial name *Sorbus aucuparia* is composed of the Latin words *sorbus* for service tree and *aucuparia*, which derives from the words *avis* for "bird" and *capere* for "catching" and describes the use fruit of *S. aucuparia* as bait for fowling.*[2] The plant is commonly known as **rowan** and **mountain-ash**,*[3] and has also been called **Amur mountain-ash**, **European mountain-ash**, **quick beam**, **quickbeam**, or **rowan-berry**.*[4] The species is unrelated to the true ash trees (genus *Fraxinus*), which also carry pinnate leaves or the species *Eucalyptus regnans*, also called mountain ash, native to Tasmania and Victoria in southeastern Australia. *[5] *S. aucuparia* was previously categorized as *Pyrus aucuparia*.*[6] The author citation *Sorbus aucuparia* L. belongs to Carl Linnaeus.

49.2 Description

Sorbus aucuparia occurs as a tree or shrub that grows up to between 5 and 15 m in height.*[7] The crown is loose and roundish or irregularly shaped but wide and the plant often grows multiple trunks.*[8]*[9] A trunk is slender and cylindrical and reaches up to 40 cm in diameter, and the branches stick out and are slanted upwards.*[2] The bark of a young *S. aucuparia* is yellowish gray and gleaming and becomes gray-black with lengthwise cracks in advanced age; it descales in small flakes.*[3]*[9] Lenticels in the bark are elongated and colored a bright ocher.*[10] The plant does not often grow older than 80 years and is one of the shortest-lived trees in temperate climate.*[9]*[11] Wood of *S. aucuparia* has a wide reddish white sapwood and a light brown to reddish brown heartwood. It is diffuse-porous, flexible, elastic, and tough, but not durable, with a density of 600 to 700 kg/m^3 in a dried state.*[3] The roots of *S. aucuparia* grow wide and deep, and the plant is capable of root sprouting and can regenerate after coppicing.*[2]

The compound leaves are pinnate with 4 to 9 pairs of leaflets on either side of a terete central vein and with a terminal leaflet.*[3] They are up to 20 cm long, 8 to 12 cm wide, and arranged in an alternate leaf pattern on a branch.*[2] The leaflets are elongated-lanceolate in shape, 2 to 6 cm long, and 1 to 2.5 cm wide with a sharply serrated edge, and have short stems or sit close to the central vein except for the outermost leaflet.*[12] Leaflets are covered in gray-silvery hairs after sprouting but become mostly bare after they unfold.*[13] Their uppers side is dark green and their underside is a grayish green and felted. Young leaflets smell like marzipan when brayed.*[13]*[14] The leaflets are asymmetrical at the bottom.*[9] *S. aucuparia* foliage grows in May and turns yellow in autumn or a dark red in dry locations.*[2]*[15]

Buds of *S. aucuparia* are often longer than 1 cm and have flossy to felted hairs.*[9] These hairs, which disappear over time, cover dark brown to black bud scales.*[16] The terminal buds are oval and pointed and larger than axillary buds, which are narrow, oval and pointed, close to the twig, and often curved towards it.*[10]*[16]

Inflorescensce of Sorbus aucuparia

S. aucuparia is monoecious.*[14] It reaches maturity at age 10 and carries ample fruit almost every year.*[2] The plant flowers from May to June (on occasion again in September) in many yellowish white corymbs that contain about 250 flowers.*[8]*[17]*[18] The corymbs are large, upright, and bulging.*[19] The flowers are between 8 and 10 mm in diameter and have five small, yellowish green, and triangular sepals that are covered in hairs or bare.*[3]*[18] The five round or oval petals are yellowish white and the flower has up to 25 stamens fused with the corolla to form a hypanthium and an ovary with two to five styles; the style is fused with the receptacle.*[3]*[19] Flowers of *S. aucuparia* have an unpleasant trimethylamine smell.*[14] Their nectar is high in fructose and glucose.*[18]

Its fruit are round pomes between 8 and 10 mm in diameter that ripen from August to October.*[14] The fruit are green before they ripen and then typically turn from orange or scarlet in color. The sepals persist as a black, five-pointed star on the ripe fruit.*[2]*[20] A corymb carries 80 to 100 pomes.*[21] A pome contains a star-shaped ovary with two to five locules each containing one or two flat, narrow, and pointed reddish seeds.*[3]*[18] The flesh of the fruit contains carotenoids, citric acid, malic acid, parasorbic acid, pectin, provitamin A, sorbitol, tannin, and vitamin C.*[22] The seeds contain glycoside.*[23]

S. aucuparia has a chromosome number of $2n$=34.*[24]

49.3 Distribution and habitat

Sorbus aucuparia *growing with Mountain Pine in the Italian Alps*

Sorbus aucuparia is found in five subspecies:[*][18][*][25]

- *Sorbus aucuparia* subsp. *aucuparia*: found in most of the species' range, less in the South
- *Sorbus aucuparia* subsp. *fenenkiana* (Georgiev & Stoj.): has thin, sparsely hairy leaflets and depressed-globose fruit, restricted to Bulgaria
- *Sorbus aucuparia* subsp. *glabrata* (Wimm. & Grab.): less hairy, found in Northern Europe and Central European mountains
- *Sorbus aucuparia* subsp. *praemorsa* (Guss.): has hairy leaflets and ovoid fruit, found in Southern Italy, Sicily, and Corsica
- *Sorbus aucuparia* subsp. *sibirica* (Hedl.): nearly hairless, found in North Eastern Russia

It can be found in almost all of Europe and the Caucasus up to Northern Russia and Siberia, but it is not native to Southern Spain, Southern Greece, Sardinia, the Balearic Islands, the Azores, and the Faroe Islands.[*][25][*][26] The species was introduced as an ornamental species in North America.[*][25] It is widespread from plains to mountains up to the tree line where it grows as the only deciduous tree species among krummholz.[*][2] In the Alps it grows at elevations of up to 2000 m.[*][8] *S. aucuparia* appears north of the boreal forest at the arctic tree line; in Norway, it is found up to the 71st parallel north.[*][3][*][25] It has naturalized in America from Washington to Alaska and eastward in Canada and the northeast of the US very successfully.

S. aucuparia is an undemanding species and can withstand shade.[*][3] It is frost hardy and can tolerate winter dryness and a brief growing season.[*][27] The plant is also resistant to air pollution, wind, and snow pressure.[*][28][*][29] *S. aucuparia* mostly grows on soil that is moderately dry to moderately damp, acidic, low on nutrients, sandy, and loose.[*][16] It often grows in stony soil or clay soil, but also sandy soil or wet peat.[*][2] The plant grows best on fresh,

loose, and fertile soil, prefers average humidity, and does not tolerate saline soil or waterlogging.*[3]*[16]*[30] It can be found in light woodland of all kinds and as a pioneer species over fallen dead trees or in clearcuttings, and at the edge of forests or at the sides of roads.*[2] Seeds of *S. aucuparia* germinate easily, so the plant may appear on inaccessible rock, ruins, branch forks, or on hollow or prunes trees.*[2]

The tallest *S. aucuparia* in the United Kingdom stands in the Chiltern Hills in South East England. This exceptional specimen is 28 m tall and has a trunk diameter of 56 cm.*[31] In Germany, an unusually large specimen is located near Wendisch Waren, a village in Mecklenburg-Vorpommern. This tree stands at more than 15 m tall, is around 100 years old, and has a diameter of 70 cm.*[32] The tallest known *S. aucuparia* in Ireland is an 18 m tall specimen at Glenstal Abbey, County Limerick.*[33]

49.4 Ecology

S. aucuparia is pollinated by bees and flies.*[14] Its seeds are not digested by birds and are thus propagated.*[34] The fruit are eaten by about 60 bird species and several mammals.*[35] They are liked particularly by thrushes and other songbirds, and are also eaten by cloven-hoofed game, red fox, European badger, dormouse, and squirrel.*[17]*[20] Fruit of *S. aucuparia* are used as a food source by migratory birds in winter, including Bohemian waxwing, spotted nutcracker, and redwing.*[15] Cloven-hoofed game also excessively browse foliage and bark.*[2] The plant roots can be found in symbiosis with arbuscular mycorrhizal and less commonly with ectomycorrhizal fungi.*[24]*[27]

It is usually later superseded by larger forest trees.*[36] In Central Europe it often grows in association with red elderberry, goat willow, Eurasian aspen, and silver birch.*[36] The plant is highly flammable and tends not to accumulate plant litter.*[27]*[37]

Other species of the genus *Sorbus* easily hybridize with *S. aucuparia* and hybrid speciation can result; hybrids include *Sorbus* × *hybrida*, a small tree with oval serrated leaves and 2 to 3 pairs of leaflets, which is a hybrid with *Sorbus* × *intermedia*, and *Sorbus thuringiaca*, a medium-size tree with elongated leaves and 1 to 3 pairs of leaflets that are sometimes fused at the central vein, which is a hybrid with *Sorbus aria*.*[38]

The main pests for *S. aucuparia* are the apple fruit moth *Argyresthia conjugella* and the mountain-ash sawfly *Hoplocampa alpina*.*[39]*[40] The rust fungus *Gymnosporangium cornutum* produces leaf galls.*[41] The leaves are not palatable to insects, but are used by insect larvae, including by the moth *Venusia cambrica*, the case-bearer moth *Coleophora anatipennella*, and leaf miners of the genus *Stigmella*. The snail *Helix aspersa* feeds on the leaves.*[41] The plant can suffer from fire blight.*[42]

49.5 Usage

Fruit of *S. aucuparia* were used in the past to lure and catch birds. To humans, the fruit are bitter, astringent, laxative, diuretic, cholagogue, prevent scurvy, and the parasorbic acid irritates the gastric mucosa.*[20]*[30] Pharmacist Mannfried Pahlow wrote that he doubted the toxicity of the fruit but advised against consuming large amounts.*[43] The fruit contain sorbitol, which can be used as a sugar substitute by diabetics, but its production is no longer relevant.*[44] *Sorbus aucuparia* fruits have been used in the traditional Austrian medicine internally (as tea, syrup, jelly or liqueur) for treatment of disorders of the respiratory tract, fever, infections, colds, flu, rheumatism and gout.*[45]

Fresh fruit are usually unpalatable, but they can be debittered and made into compote, jelly, jam, a tangy syrup, a tart chutney, or juice, as well as wine and liqueur, or used for tea or to make flour.*[20]*[46]*[47] Fruit are served as a side dish to lamb or game.*[29] Debittering can be accomplished by freezing, cooking, or drying, which degrades the parasorbic acid.*[43]*[47] The fruit are red colored in August but usually only harvested in October after the first frost by cutting the corymbs.*[22]*[48] The robust qualities of *S. aucuparia* make it a source for fruit in harsh mountain climate and Maria Theresa of the Habsburg Monarchy recommended the planting of the species in 1779.*[29]

An edible variety, named *Sorbus aucuparia* var. *dulcis* Kraetzl, or var. *edulis* Dieck, or var. *moravica* Dippel, was first discovered in 1810 near Ostružná in the Hrubý Jeseník mountain range of Northern Moravia and became widespread in Germany and Austria the early 20th century.*[49]*[50] Its leaves are larger and pointed, only the front part of the leaflets is serrated, and they have darker bark, larger buds and larger fruit.*[51] Similar non-bitter varieties found in Southern Russia were first introduced in Central Europe in 1900 as 'Rossica' and 'Rossica Major', which has large fruit up to 1.5 cm in diameter.*[52]

Two widespread cultivars of the Moravian variety are 'Konzentra' and 'Rosina', which were selected beginning in

Damage caused by game

1946 by the Institut für Gartenbau Dresden-Pillnitz, an agricultural research institute in Saxony, from 75 specimen found mostly in the Ore Mountains, and made available in 1954.*[52] Fruit of the more widely used 'Konzentra' are small to medium-sized, mildly aromatic and tart, easier to transport because of their thicker peel, and used for juicing, while fruit of 'Rosina' are larger, sweet and tart, and aromatic, and candied or used in compote.*[53]*[54] The two cultivars are self-pollinating, yield fruit early, and the sugar content increases while the acid content decreases as the fruit ripen.*[55] 'Beissneri' is a cultivar with reddish foliage and bark and serrated leaves.*[50] Other edible varieties originate in and are named after Klosterneuburg, Lower Austria.*[56]

Comparison of Sorbus aucuparia *fruit from an edible cultivar (left) and a roadside tree (right)*

Russian botanist Ivan Vladimirovich Michurin began in 1905 to crossbreed common *S. aucuparia* with other species to create fruit trees. His experiments resulted in the cultivars 'Burka', 'Likjornaja', 'Dessertnaja', 'Granatnaja', 'Rubinovaja', and 'Titan'.*[52] Other *S. aucuparia* hybrids planted in Western Europe beginning in the 1980s include 'Apricot Queen', 'Brilliant Yellow', 'Chamois Glow', 'Pink Queen', and 'Salmon Queen'.*[57]

The leaves were fermented with leaves of sweet gale and oak bark to create herb beer.*[44] Fruit are eaten as a mash in small amounts against lack of appetite or an upset stomach and stimulate production of gastric acid.*[43] In folk medicine they are used as a laxative, against rheumatism and kidney disease, and as a gargled juice against hoarseness.*[23]

Wood of *S. aucuparia* is used for cartwright's work, turner's work, and woodcarving.*[2] Wood can be used from trees as young as 20 years.*[36] In almost treeless regions it is used as firewood.*[6] The leaves are sometimes used as fodder for livestock while the fruit are used against erysipeloid infections in domestic pigs and goats.*[3] Bark of the plant was used to dye wool brown or red.*[44] Honey from *S. aucuparia* flowers is strongly aromatic and has a reddish color.*[58]

S. aucuparia is planted in mountain ranges to fortify landslides and avalanche zones.*[36] It is also used as an ornamental plant in parks, gardens, or as an avenue tree.*[17] Ornamental cultivars include 'Asplenifolia', which has divided and sharply serrated leaflets, 'Blackhawk', which has large fruit and dark green foliage, 'Fastigiata', which has an upright columnar form, 'Fructu Luteo', which has orange yellow fruit, 'Michred', which has brilliant red fruit, 'Pendula', which is a weeping tree, 'Sheerwater Seedling', which is upright and slender, and 'Xanthocarpa', which has orange yellow fruit.*[42]*[59]*[60] Cultivars are vegetatively propagated via cuttings, grafting, or shield budding.*[59]

49.6 Mythology and customs

Main article: Rowan § Mythology_and_folklore

In the *Prose Edda*, the Norse god Thor saves himself from a rapid river created by the giantess Gjálp by grabbing hold of a rowan, which became known as “Thor's protection”.*[61]

In English folklore of the Victorian era, twigs of *S. aucuparia* were believed to ward off evil spirits*[20] and witches.*[62]*[63]*[64] The plant was called “the witch” in England and dowsing rods to find ores were made out of its wood.*[44] Twigs of *S. aucuparia* were used to drive cattle to the pasture for the first time in spring to ensure their health and fertility.*[65] The wooden shafts of forks and other farm implements were constructed from *S. aucuparia*, to protect farm animals

and production from witches' spells.*[62] In weather lore, a year with plentiful rowan fruit would have a good grain harvest but be followed by a severe winter.*[20]

S. aucuparia is used in the coats of arms of the German municipalities Ebernhahn, Eschenrode, and Hermsdorf, and of the Vysočina Region of the Czech Republic. Rowan is part of the coat of arms of the Metropolitan Borough of Wigan and the logo of the Wigan Warriors.

49.7 Footnotes

[1] McAllister, H.A. (2005). *The genus* Sorbus*: Mountain Ash and other Rowans*. Kew Publishing. ISBN 9781842460887.

[2] Erlbeck, Haseder, Stinglwagner 1998, p. 166

[3] Godet 1994, p. 52

[4] "Sorbus aucuparia information from NPGS/GRIN". Germplasm Resources Information Network. Archived from the original on 7 April 2013. Retrieved 7 April 2013.

[5] Breckwoldt 2011, p. 152

[6] Hora 1993, p. 184

[7] Schauer 2001, p. 342

[8] Zauner 2000, p. 52

[9] Harz 2009, p. 72

[10] Godet 2008, p. 110

[11] Laudert 1999, p. 57

[12] Godet 1994, p. 138

[13] Reichholf, Steinbach 1992, p. 103

[14] Hecker 1995, p. 130

[15] Smolik 1996, p. 63

[16] Godet 2008, p. 378

[17] Kremer 2010, p. 42

[18] Raspé, Findlay, Jacquemart 2000, p. 910

[19] Godet 1998, p. 68

[20] Erlbeck, Haseder, Stinglwagner 1998, p. 167

[21] Garcke 1972, p. 722

[22] Breckwoldt 2011, p. 153

[23] Hensel 2007, p. 112

[24] Raspé, Findlay, Jacquemart 2000, p. 916

[25] Raspé, Findlay, Jacquemart 2000, p. 911

[26] Větvička 1995, p. 200

[27] Raspé, Findlay, Jacquemart 2000, p. 915

[28] Laudert 1999, p. 80

[29] Laudert 1999, p. 83

[30] Aichele, Golte-Bechtle 1997, p. 78

[31] "Record Rowan". Chilterns Conservation Board. Archived from the original on 7 April 2013. Retrieved 7 April 2013.

[32] Ullrich, Kühn, Kühn 2009, p. 29

[33] "Rowan (Sorbus aucuparia L.)" (PDF). Department of Agriculture, Food and the Marine. 2001.

[34] Lohmann 2005, p. 60

[35] Laudert 1999, p. 81

[36] Lohmann 2005, p. 61

[37] Raspé, Findlay, Jacquemart 2000, p. 913

[38] Hora 1993, p. 185–186

[39] Friedrich, Schuricht 1989, p. 43

[40] Friedrich, Schuricht 1989, p. 44

[41] Alan Watson Featherstone (8 November 2010). "Trees for Life - Rowan Species Profile". Trees for Life. Archived from the original on 26 April 2013. Retrieved 26 April 2013.

[42] Flint 1997, p. 641

[43] Pahlow 1993, p. 106

[44] Laudert 1999, p. 84

[45] Vogl S, Picker P, Mihaly-Bison J, Fakhrudin N, Atanasov AG, Heiss EH, Wawrosch C, Reznicek G, Dirsch VM, Saukel J, Kopp B (Oct 2013). "Ethnopharmacological *in vitro* studies on Austria's folk medicine - An unexplored lore *in vitro* anti-inflammatory activities of 71 Austrian traditional herbal drugs.". *Journal of Ethnopharmacology* **149** (3): 750–71. doi:10.1016/j.jep.2013.06.007. PMID 23770053.

[46] Henschel 2002, p. 220

[47] Dreyer 2009, p. 108

[48] Pahlow 1993, p. 105

[49] Friedrich, Schuricht 1989, p. 37

[50] Friedrich, Schuricht 1989, p. 38

[51] Friedrich, Schuricht 1989, p. 40

[52] Friedrich, Schuricht 1989, p. 41

[53] Friedrich, Schuricht 1989, p. 276

[54] Friedrich, Schuricht 1989, p. 277

[55] Fischer 1995, p. 213

[56] Neuweiler, Röthlisberger, Rusterholz, Terrettaz 2000, p. 214

[57] Friedrich, Schuricht 1989, p. 42

[58] Friedrich, Schuricht 1989, p. 45

[59] *Enzyklopädie der Garten- und Zimmerpflanzen* 1994, p. 572

[60] Paul, Rees 1990, p. 141

[61] McTurk 1997, p. 205

[62] Simpson, J.; Roud, S. (2000). *Dictionary of English folklore*. Oxford University Press, Incorporated. ISBN 9780192100191.

[63] "Witchcraft: The Mountain Ash", in *The Table Book*, ed. William Hone, (London: 1827) p. 337.

[64] "The Mountain Ash, or Wicken or Wiggen Tree", in Lancashire Folk-lore: Illustrative of the Superstitious Beliefs and Practices, Local Customs and Usages of the People of the County Palatine*, edited by John Harland and T. T. Wilkinson, (London: 1867) p 72-74.*

[65] Scherf 2006, p. 58

49.8 References

- *Enzyklopädie der Garten- und Zimmerpflanzen* (in German). Munich: Orbis. 1994. ISBN 3-572-00685-6.
- Aichele, Dietmar; Golte-Bechtle, Marianne (1997). *Das neue Was blüht denn da?* (in German) (56th ed.). Stuttgart: Kosmos. ISBN 3-440-07244-4.
- Hora, Bayard, ed. (1993). *Bäume der Welt* (in German). Translated by Wolfgang Steuer (2nd ed.). Stuttgart: DRW-Verlag. ISBN 3-87181-205-6.
- Breckwoldt, Michael (2011). *Essen aus der Natur* (in German). Berlin: Stiftung Warentest. ISBN 978-3-86851-021-8.
- Dreyer, Eva-Maria (2009). *Welche Wildkräuter und Beeren sind das?* (in German). Stuttgart: Kosmos. ISBN 978-3-440-11808-5.
- Erlbeck, Reinhold; Haseder, Ilse E.; Stinglwagner, Gerhard K. F. (1998). *Das Kosmos Wald- und Forstlexikon* (in German). Stuttgart: Kosmos. ISBN 3-440-07511-7.
- Fischer, Manfred (1995). *Farbatlas Obstsorten* (in German). Stuttgart: Ulmer. ISBN 3-8001-5542-7.
- Flint, Harrison L. (1997). *Landscape Plants for Eastern North America*. Wiley. ISBN 0-471-59919-0.
- Friedrich, Gerhard; Schuricht, Werner (1989). *Seltenes Kern-, Stein- und Beerenobst* (in German) (1st ed.). Melsungen: Neumann-Neudamm. ISBN 3-7888-0562-5.
- Garcke, August (1972). von Weihe, Konrad, ed. *Illustrierte Flora* (in German) (23rd ed.). Berlin, Hamburg: Parey. ISBN 3-489-68034-0.
- Godet, Jean-Denis (1994). *Bäume und Sträucher* (in German). Augsburg: Naturbuch-Verlag. ISBN 3-89440-154-0.
- Godet, Jean-Denis (1998). *Einheimische Bäume und Sträucher* (in German). Augsburg: Naturbuch-Verlag. ISBN 3-89440-296-2.
- Godet, Jean-Denis (2008). *Knospen und Zweige* (in German). Stuttgart: Ulmer. ISBN 978-3-8001-5778-5.
- Harz, Kurt (2009). *Bäume und Sträucher* (in German) (14th ed.). Munich: BLV. ISBN 978-3-8354-0479-3.
- Hecker, Ulrich (1995). *Bäume und Sträucher*. Früchte, Knospen, Rinden (in German) (3rd ed.). Munich: BLV. ISBN 3-405-13737-3.
- Henschel, Detlev (2002). *Essbare Wildbeeren und Wildpflanzen* (in German) (1st ed.). Stuttgart: Kosmos. ISBN 3-440-09154-6.
- Hensel, Wolfgang (2007). *Welche Heilpflanze ist das?* (in German). Stuttgart: Kosmos. ISBN 978-3-440-10798-0.
- Kremer, Bruno P. (2010). *Essbare & giftige Wildpflanzen* (in German). Stuttgart: Ulmer. ISBN 978-3-8001-5344-2.
- Laudert, Doris (1999). *Mythos Baum* (in German) (2nd ed.). Munich: BLV. ISBN 3-405-15350-6.
- Lohmann, Michael (2005). *Bäume & Sträucher* (in German). Munich: BLV. ISBN 3-405-16875-9.
- McTurk, Rory (1997). "Marie de France, Geirmundar þáttr heljarskinns, and reader-response criticism". In Lecouteux, Claude. *Hugur*. Paris: Presses de l'Université de Paris-Sorbonne. ISBN 2-84050-089-2.
- Neuweiler, Reto; Röthlisberger, Kurt; Rusterholz, Peter; Terrettaz, Roland (2000). *Beeren und besondere Obstarten* (in German) (1st ed.). Zollikofen: LmZ. ISBN 3-906679-75-6.
- Pahlow, Mannfried (1993). *Das große Buch der Heilpflanzen* (in German) (Revised ed.). Munich: Gräfe und Unzer. ISBN 3-7742-1472-7.
- Paul, Anthony; Rees, Yvonne (1990). *Bäume im Garten* (in German). Translated by Erhard Held. Ravensburg: O. Maier. ISBN 3-473-46173-3.

- Raspé, Olivier; Findlay, Catherine; Jacquemart, Anne-Laure (2000). "Sorbus aucuparia L". *Journal of Ecology* **88** (5): 910–930. doi:10.1046/j.1365-2745.2000.00502.x.
- Reichholf, Josef H.; Steinbach, Gunter, eds. (1992). *Naturenzyklopädie Europas* (in German) **7**. Munich: Mosaik. ISBN 3-576-10107-1.
- Schauer, Thomas (2001). *Der große BLV-Pflanzenführer* (in German) (8th ed.). Munich: BLV. ISBN 3-405-16014-6.
- Scherf, Gertrud (2006). *Wildpflanzen neu entdecken* (in German) (1st ed.). Munich: BLV. ISBN 978-3-8354-0062-7.
- Smolik, H. W. (1996). *Naturführer Deutschland* (in German). Cologne: Tigris. ISBN 3-632-98919-2.
- Ullrich, Bernd; Kühn, Uwe; Kühn, Stefan (2009). *Unsere 500 ältesten Bäume* (in German). Munich: BLV. ISBN 978-3-8354-0376-5.
- Větvička, Václav (1995). *Dausien's grosses Buch der Bäume und Sträucher* (in German). Translated by Jürgen Ostmeyer (3rd ed.). Hanau: Dausien. ISBN 3-7684-2509-6.
- Zauner, Georg (2000). *GU-Kompass Laubbäume* (in German) (10th ed.). Munich: Gräfe und Unzer. ISBN 3-7742-6205-5.

49.9 External links

Chapter 50

Sorbus aria

Sorbus aria (syn. *Aria nivea*), the **whitebeam** or **common whitebeam** is a European and Near-Eastern deciduous tree, the type species of the subgenus of the whitebeams. Typically compact and domed, with few upswept branches and almost-white underside of the leaves. It generally favours dry limestone and chalk soils. The hermaphrodite cream-white flowers appear in May, are insect pollinated, and go on to produce scarlet berries, which are often eaten by birds.*[1] Developed for garden use are the cultivars *S. aria* 'Lutescens',*[2] with very whitish-green early leaves, and *S. aria* 'Majestica',*[3] with large leaves. Both have gained the Royal Horticultural Society's Award of Garden Merit.

50.1 References

[1] The Reader's Digest Field Guide to the Trees and Shrubs of Britain *p.86*.

[2] "RHS Plant Selector - *Sorbus aria* 'Lutescens'". Retrieved 4 June 2013.

[3] "RHS Plant Selector - *Sorbus aria* 'Majestica'". Retrieved 4 June 2013.

Chapter 51

Sorbus domestica

Sorbus domestica (**service tree**, or sometimes **true service tree** to distinguish it from the wild service tree; syn. *Cormus domestica* (L.) Spach) is a species of *Sorbus* native to western, central and southern Europe, northwest Africa (Atlas Mountains), and southwest Asia (east to the Caucasus).*[1]*[2]*[3]*[4]*[5]

It is a deciduous tree growing to 15–20 m (rarely to 30 m) tall with a trunk up to 1 m diameter, though can also be a shrub 2–3 m tall on exposed sites. The bark is brown, smooth on young trees, becoming fissured and flaky on old trees. The winter buds are green, with a sticky resinous coating. The leaves are 15–25 cm long, pinnate with 13-21 leaflets 3–6 cm long and 1 cm broad, with a bluntly acute apex, and a serrated margin on the outer half or two thirds of the leaflet. The flowers are 13–18 mm diameter, with five white petals and 20 creamy-white stamens; they are produced in corymbs 10–14 cm diameter in late spring, and are hermaphrodite and insect pollinated. The fruit is a pome 2–3 cm long, greenish-brown, often tinged red on the side exposed to sunlight; it can be either apple-shaped (f. *pomifera* (Hayne) Rehder) or pear-shaped (f. *pyrifera* (Hayne) Rehder).*[1]*[2]*[3]*[4]

51.1 Ecology

It is generally rare, being listed as an endangered species in Switzerland and Austria, and uncommon in Spain.*[1] In the UK, one very old tree that existed in the Wyre Forest before being destroyed in 1862 used to be considered native, but it is now generally considered to be more likely of cultivated origin, probably from a mediaeval monastery orchard planting.*[4] More recently, a small population of genuinely wild specimens was found growing as stunted shrubs on cliffs in south Wales (Glamorgan) and nearby southwest England (Gloucestershire).*[4]*[5] It is a very rare species in Britain, occurring at only a handful of sites. Its largest English population is within the Horseshoe Bend Site of Special Scientific Interest at Shirehampton, near Bristol.

A further population has been discovered growing wild in Cornwall on a cliff in the upper Camel Estuary.*[6]

It is a long-lived tree, with ages of 300–400 years estimated for some in Britain.*[4]

The largest and perhaps one of oldest known specimen in Europe is on “oskeruše” educational trail near the town of Strážnice in the province of Moravia, Czech Republic. Its trunk measures 462 centimetres (15.16 ft) in circumference, with a crown 11 metres (36 ft) high and 18 metres (59 ft) across. It is estimated to be around 450 years old. http://www.treeforeurope.com/

51.2 Cultivation and uses

The fruit is a component of a cider-like drink which is still made in parts of Europe. Picked straight off the tree, it is highly astringent and gritty; however, when left to blet (over-ripen) it sweetens and becomes pleasant to eat.*[1]*[7] In the Czech Republic province of Moravia, region Slovacko, there is a community run museum, with an educational trail and festival for this tree, with products like jam, juice and brandy made from its fruit. *[8]

The sorb tree is cited in the Babylonian Talmud, Tractate Ketubot page 79a. The example refers to a purchase of Abba Zardasa, in a translation by Rashi, an early Medieval scholar, as a forest of trees called Zardasa, that was used for lumber, because the fruit was not commercially important. The Aramaic word 'zardasa' may be the origin of the

Foliage and fruit

English word 'sorb'.

51.3 Etymology and other names

The English name comes from Middle English *serves*, plural of *serve*, from Old English *syrfe*, borrowed from the Latin name *sorbus*; it is unrelated to the verb *serve*.*[9] Other English names include **sorb**, **sorb tree**, and **whitty pear**—"whitty" because the leaves are similar to rowan (i.e. pinnate), and "pear" due to the nature of the fruit.

51.4 See also

- *Amelanchier*, also called serviceberry

51.5 References

[1] Rotach, P. (1995). Service tree *Sorbus domestica* Technical guidelines for genetic conservation and use. EUFORGEN. Available online (pdf file)

[2] Rushforth, K. (1999). *Trees of Britain and Europe*. Collins ISBN 0-00-220013-9.

[3] Mitchell, A. F. (1974). *A Field Guide to the Trees of Britain and Northern Europe*. Collins ISBN 0-00-212035-6

[4] Hampton, M., & Kay, Q. O. N. (1995). *Sorbus domestica* L., new to Wales and the British Isles. *Watsonia* 20 (4): 379-384. Available online (pdf file)

[5] Hampton, M. (1996). Sorbus domestica L. - comparative morphology and habitats. *BSBI News* 73.

[6] Pearman, David. "BSBI News No. 125 January 2014 pages 37-38 by Ian Bennallick and David Pearman". Maney Online, BSBI.

[7] Bean, W. J. (1980). *Trees and Shrubs Hardy in the British Isles* 8th ed., vol. 4. John Murray ISBN 0-7195-2428-8.

[8] Hrdousek V. et al: "Oskeruše - strom pro novou Evropu". Brazda, Hodonin, 2014, 240 pages; 550 pictures

[9] Oxford English Dictionary

51.6 Further reading

- Wedig Kausch-Blecken von Schmeling: *Der Speierling*. Verlag Kausch, Bovenden 2000, 184 S.
- Hrdousek V. et al.: "Oskeruše - strom pro novou Evropu". Brazda, Hodonin, 2014, 240 pages; 550 pictures

Chapter 52

Sorbus torminalis

Sorbus torminalis (syn. *Torminalis clusii*, **wild service tree**), sometimes known as the **chequer tree** or **checker tree**, is a species of *Sorbus* native to Europe from England and Wales east to Denmark and Poland, south to northwest Africa, and southeast to southwest Asia from Asia Minor to the Caucasus and Alborz mountains.*[1]

It is a medium-sized deciduous tree growing to 15–25 m tall, with a trunk up to 1.3 m diameter. The bark is smooth and greyish, but flaky, peeling away in squarish plates to reveal darker brown layers. The leaves are 6–14 cm long and broad with a 2.5–5 cm petiole, dark green on both sides, with five to nine acute lobes; the basal pair of lobes are spreading, the rest more forward-pointing and decreasing in size to the leaf apex, and with finely toothed margins; the undersides have small hairs when young, but both sides are smooth and shiny when older; the autumn colour is yellow to red-brown. The flowers are 10–15 mm diameter, with five white petals and 20 creamy-white stamens; they are produced in corymbs 5–12 cm diameter in late spring to early summer, and are hermaphrodite and insect pollinated. The fruit is a globose to ovoid pome 10–15 mm diameter, greenish to russet or brown, patterned with small pale lenticel spots when mature in mid to late autumn.*[1]*[2]*[3]

There are two varieties:*[1]

- *Sorbus torminalis* var. *torminalis*. Europe, northwest Africa.
- *Sorbus torminalis* var. *caucasica*. Caucasus and Alborz Mountains. Leaves less deeply lobed than in var. *torminalis*.

52.1 Ecology

It is relatively rare and in Britain is now usually confined to pockets of ancient woodland, although it can also be found growing in hedgerows. It can often be found associated with oak and ash woods, preferring clay and lime based soils. In Britain, summer temperatures are often too low for the seeds to ripen, so its principal method of propagation is by suckers.*[1]

52.2 Uses and etymology

The fruit, sometimes called "chequers," are edible and taste similar to dates, although they are now rarely collected for food. They are usually too astringent to eat until they are over-ripe and bletted. They were traditionally known as a herbal remedy for colic; the tree's Latin name, *torminalis* means 'good for colic'. Before the introduction of hops, the fruit were used to flavour beer, which may be related to the ancient symbol of a pub being the chequer-board (although it has also been suggested that the pub name itself was originally brought by the Romans. Alternatively, the name "chequers" may have been derived from the spotted pattern of the fruit,*[4] though some suggest from the pattern of the bark on old trees.

Foliage and fruit

52.3 Taxonomy

The species has sometimes been placed in its own genus, *Torminalis* Medik. (incorrectly *Torminaria* M.Roem. and *Torminaria* Opiz). It is a sexually reproducing diploid species that forms diploid and polyploid hybrids with members of subgenus *Aria* (whitebeams).*[5] A number of often very localised stable apomictic polyploid species of ultimately hybrid origin between *Sorbus torminalis* and various species in the subgenus *Aria* occur in Europe, including *Sorbus latifolia* (service tree of Fontainebleau), and *Sorbus bristoliensis* (Bristol whitebeam).*[1]

52.4 Gallery

- Leaves
- Flowers
- Foliage and fruit
- Autumn leaf colour
- Trunk and leaf canopy

52.5 Further reading

- Wedig Kausch-Blecken von Schmeling: *Die Elsbeere*. Bovenden 1994, ISBN 3-88452-925-0
- Roper, P. (1993) "The distribution of the Wild Service Tree Sorbus torminalis (L.) Crantz, in the British Isles", *Watsonia*, 19, pp.209-229:

52.6 References

[1] Rushforth, K. (1999). *Trees of Britain and Europe*. Collins ISBN 0-00-220013-9.

[2] Mitchell, A. F. (1974). *A Field Guide to the Trees of Britain and Northern Europe*. Collins ISBN 0-00-212035-6

[3] Blamey, M. & Grey-Wilson, C. (1989). *Flora of Britain and Northern Europe*. ISBN 0-340-40170-2

[4] *Oxford English Dictionary*

[5] Pellicer, J.; Clermont, S.; Houston, L.; Rich, T.C.; Fay, M.F. (2012). "Cytotype diversity in the *Sorbus* complex (Rosaceae) in Britain: sorting out the puzzle" . *Annals of Botany* **110** (6): 1185–1193. doi:10.1093/aob/mcs185.

52.7 External links

- Wild Service Tree at rhs.org.uk

Chapter 53

Willow

For other uses, see Willow (disambiguation).
"Willow tree" redirects here. For Willow tree figurines, see Willow Tree (figurines).
"Salix" redirects here. For other uses, see Salix (disambiguation).

Willows, also called **sallows**, and **osiers**, form the genus ***Salix***, around 400 species*[2] of deciduous trees and shrubs, found primarily on moist soils in cold and temperate regions of the Northern Hemisphere. Most species are known as willow, but some narrow-leaved shrub species are called **osier**, and some broader-leaved species are referred to as **sallow** (from Old English *sealh*, related to the Latin word *salix*, willow). Some willows (particularly arctic and alpine species) are low-growing or creeping shrubs; for example, the dwarf willow (*Salix herbacea*) rarely exceeds 6 cm (2.4 in) in height, though it spreads widely across the ground.

53.1 Description

Willows all have abundant watery bark sap, which is heavily charged with salicylic acid, soft, usually pliant, tough wood, slender branches, and large, fibrous, often stoloniferous roots. The roots are remarkable for their toughness, size, and tenacity to life, and roots readily grow from aerial parts of the plant.

The leaves are typically elongated, but may also be round to oval, frequently with serrated edges. Most species are deciduous; semievergreen willows; coriaceous leaves are rare, e.g. *Salix micans* and *S. australior* in the eastern Mediterranean. All the buds are lateral; no absolutely terminal bud is ever formed. The buds are covered by a single scale. Usually, the bud scale is fused into a cap-like shape, but in some species it wraps around and the edges overlap.*[3] The leaves are simple, feather-veined, and typically linear-lanceolate. Usually they are serrate, rounded at base, acute or acuminate. The leaf petioles are short, the stipules often very conspicuous, resembling tiny, round leaves, and sometimes remaining for half the summer. On some species, however, they are small, inconspicuous, and caducous (soon falling). In color, the leaves show a great variety of greens, ranging from yellowish to bluish.

53.1.1 Flowers

Willows are dioecious, with male and female flowers appearing as catkins on different plants; the catkins are produced early in the spring, often before the leaves, or as the new leaves open.

The staminate (male) flowers are without either calyx or corolla; they consist simply of stamens, varying in number from two to 10, accompanied by a nectariferous gland and inserted on the base of a scale which is itself borne on the rachis of a drooping raceme called a catkin, or ament. This scale is square, entire, and very hairy. The anthers are rose-colored in the bud, but orange or purple after the flower opens; they are two-celled and the cells open longitudinally. The filaments are threadlike, usually pale brown, and often bald.

The pistillate (female) flowers are also without calyx or corolla, and consist of a single ovary accompanied by a small, flat nectar gland and inserted on the base of a scale which is likewise borne on the rachis of a catkin. The ovary is one-celled, the style two-lobed, and the ovules numerous.

At the base of the petiole a pair of stipules form. These may fall in spring, or last for much of the summer or even for more than one year (marcescence).

53.2 Cultivation

Almost all willows take root very readily from cuttings or where broken branches lie on the ground. The few exceptions include the goat willow (*Salix caprea*) and peachleaf willow (*Salix amygdaloides*). One famous example of such growth from cuttings involves the poet Alexander Pope, who begged a twig from a parcel tied with twigs sent from Spain to Lady Suffolk. This twig was planted and thrived, and legend has it that all of England's weeping willows are descended from this first one.*[4]*[5]

Willows are often planted on the borders of streams so their interlacing roots may protect the bank against the action of the water. Frequently, the roots are much larger than the stem which grows from them.

53.3 Hybrids

Willows are very cross-fertile, and numerous hybrids occur, both naturally and in cultivation. A well-known ornamental example is the weeping willow (*Salix* × *sepulcralis*), which is a hybrid of Peking willow (*Salix babylonica*) from China and white willow (*Salix alba*) from Europe.

The hybrid cultivar 'Boydii' has gained the Royal Horticultural Society's Award of Garden Merit.*[6]

53.4 Ecological issues

Willows are used as food plants by the larvae of some Lepidoptera species, such as the mourning cloak butterfly.*[7] Ants, such as wood ants, are common on willows inhabited by aphids, coming to collect aphid honeydew, as sometimes do wasps.

Young male catkin

A small number of willow species were widely planted in Australia, notably as erosion-control measures along watercourses. They are now regarded as invasive weeds, and many catchment management authorities are removing and replacing them with native trees.[*][8][*][9]

Willow roots spread widely and are very aggressive in seeking out moisture; for this reason, they can become problematic when planted in residential areas, where the roots are notorious for clogging French drains, drainage systems, weeping tiles, septic systems, storm drains, and sewer systems, particularly older, tile, concrete, or ceramic pipes. Newer, PVC sewer pipes are much less leaky at the joints, and are therefore less susceptible to problems from willow roots; the same is true of water supply piping.[*][10][*][11]

53.5 Pests and diseases

Willow species are hosts to more than a hundred aphid species, belonging to *Chaitophorus* and other genera,[*][12] forming large colonies to feed on plant juices, on the underside of leaves in particular.[*][13] Rust, caused by fungi of genus *Melampsora*, is known to damage leaves of willows, covering them with orange spots.[*][14]

53.6 Uses

53.6.1 Medicine

The leaves and bark of the willow tree have been mentioned in ancient texts from Assyria, Sumer and Egypt[*][15] as a remedy for aches and fever,[*][16] and in Ancient Greece the physician Hippocrates wrote about its medicinal properties in the fifth century BC. Native Americans across the Americas relied on it as a staple of their medical treatments. It provides temporary pain relief. Salicin is metabolized into salicylic acid in the human body, and is a precursor of aspirin.[*][17] In 1763, its medicinal properties were observed by the Reverend Edward Stone in England.

Knotted willow and woodpile in the Bourgoyen-Ossemeersen, Ghent, Belgium

He notified the Royal Society, which published his findings. The active extract of the bark, called salicin, was isolated to its crystalline form in 1828 by Henri Leroux, a French pharmacist, and Raffaele Piria, an Italian chemist, who then succeeded in separating out the compound in its pure state. In 1897, Felix Hoffmann created a synthetically altered version of salicin (in his case derived from the *Spiraea* plant), which caused less digestive upset than pure salicylic acid. The new drug, formally acetylsalicylic acid, was named Aspirin by Hoffmann's employer Bayer AG. This gave rise to the hugely important class of drugs known as nonsteroidal anti-inflammatory drugs (NSAIDs).

Willow has been listed as one of the 38 substances used to prepare Bach flower remedies,*[18] a kind of alternative medicine promoted for its effect on health. However, according to Cancer Research UK, "there is no scientific evidence to prove that flower remedies can control, cure or prevent any type of disease, including cancer" .*[19]

53.6.2 Manufacturing

Some of humans' earliest manufactured items may have been made from willow. A fishing net made from willow dates back to 8300 BC.*[20] Basic crafts, such as baskets, fish traps, wattle fences and wattle and daub house walls, were often woven from osiers (rod-like willow shoots, often grown in coppices). One of the forms of Welsh coracle traditionally uses willow in the 'lats'. Thin or split willow rods can be woven into wicker, which also has a long history. The relatively pliable willow is less likely to split while being woven than many other woods, and can be bent around sharp corners in basketry. Willow wood is also used in the manufacture of boxes, brooms, cricket bats (grown from certain strains of white willow), cradle boards, chairs and other furniture, dolls, flutes, poles, sweat lodges, toys, turnery, tool handles, veneer, wands and whistles. In addition, tannin, fibre, paper, rope and string can be produced from the wood. Willow is also used in the manufacture of double basses for backs, sides and linings, and in making splines and blocks for bass repair.

53.6.3 Other

Male catkin of Salix cinerea *with bee*

- **Agriculture**: Willows produce a modest amount of nectar from which bees can make honey, and are especially valued as a source of early pollen for bees. Poor people at one time often ate willow catkins that had been cooked to form a mash.*[21]

- **Art**: Willow is used to make charcoal (for drawing) and in living sculptures. Living sculptures are created from live willow rods planted in the ground and woven into shapes such as domes and tunnels. Willow stems

Willow tree with woodbine honeysuckle

are used to weave baskets and three-dimensional sculptures, such as animals and figures. Willow stems are also used to create garden features, such as decorative panels and obelisks.

- **Energy**: Willow is grown for biomass or biofuel, in energy forestry systems, as a consequence of its high energy in-energy out ratio, large carbon mitigation potential and fast growth.*[22] Large-scale projects to support willow as an energy crop are already at commercial scale in Sweden,*[23] and in other countries, others are being developed through initiatives such as the Willow Biomass Project in the US and the Energy Coppice Project in the UK.*[24] Willow may also be grown to produce charcoal.
- **Environment**: As a plant, willow is used for biofiltration, constructed wetlands, ecological wastewater treatment systems, hedges, land reclamation, landscaping, phytoremediation, streambank stabilisation (bioengineering), slope stabilisation, soil erosion control, shelterbelt and windbreak, soil building, soil reclamation, tree bog compost toilet, and wildlife habitat.
- **Religion**: Willow is one of the "Four Species" used ritually during the Jewish holiday of Sukkot. In Buddhism, a willow branch is one of the chief attributes of Kwan Yin, the *bodhisattva* of compassion. Christian churches in northwestern Europe and Ukraine often used willow branches in place of palms in the ceremonies on Palm Sunday.*[25]

53.7 Culture

In China, some people carry willow branches with them on the day of their Tomb Sweeping or Qingming Festival. Willow branches are also put up on gates and/or front doors, which they believe help ward off the evil spirits that wander on Qingming. Legend states that on Qingming Festival, the ruler of the underworld allows the spirits of the dead to return to earth. Since their presence may not always be welcome, willow branches keep them away.*[26] In traditional pictures of the Goddess of Mercy Guanyin, she is often shown seated on a rock with a willow branch in a vase of water at her side. The Goddess employs this mysterious water and the branch for putting demons to

The willow tree as seen as the main part of an heraldic escutcheon over the main portal of a patrician house belonging to the Salis family in Chur, Switzerland, circa *1750*

Environmental art installation "Sandworm" in the Wenduine Dunes, Belgium, made entirely out of willow

flight. Taoist witches also use a small carving made from willow wood for communicating with the spirits of the dead. The image is sent to the nether world, where the disembodied spirit is deemed to enter it, and give the desired information to surviving relatives on its return.*[27] The willow is a famous subject in many East Asian nations' cultures, particularly in pen and ink paintings from China and Japan.

A *gisaeng* (Korean geisha) named Hongrang, who lived in the middle of the Joseon Dynasty, wrote the poem "By the willow in the rain in the evening", which she gave to her parting lover (Choi Gyeong-chang).*[28] Hongrang wrote:

> "...I will be the willow on your bedside."

In Japanese tradition, the willow is associated with ghosts. It is popularly supposed that a ghost will appear where a willow grows. Willow trees are also quite prevalent in folklore and myths.*[29]*[30]

In English folklore, a willow tree is believed to be quite sinister, capable of uprooting itself and stalking travellers. The Viminal Hill, one of the Seven Hills Of Rome, derives it name from the Latin word for osier, *viminia* (pl.).

- Hans Christian Andersen wrote a story called "Under the Willow Tree" (1853) in which children ask questions of a tree they call "willow-father", paired with another entity called "elder-mother".*[31]
- Old Man Willow in J. R. R. Tolkien's legendarium, appearing in *The Lord of the Rings*.
- "Green Willow" is a Japanese ghost story in which a young samurai falls in love with a woman called Green Willow who has a close spiritual connection with a willow tree.*[32] "The Willow Wife" is another, not dissimilar tale.*[33] "Wisdom of the Willow Tree" is an Osage Nation story in which a young man seeks answers from a willow tree, addressing the tree in conversation as 'Grandfather'.*[34]
- In "The Secret of Salix Babylonicus," set in the Babylonian exile, the willow is portrayed benignly as a symbol of sympathy in grief and perseverance in suffering, an upright character who shows solidarity with the exiles and comes to express the spirit of the psalms.
- The "Whomping Willow" is a feature of the grounds of Hogwarts School for Witchcraft and Wizardry in the Harry Potter stories.

53.8 Selected species

Main article: List of Salix species

The genus *Salix* is made up of around 400 species*[2] of deciduous trees and shrubs:

- *Salix acutifolia* Willd. – long-leaved violet willow
- *Salix alaxensis* (Andersson) Coville
- *Salix alba* L. – white willow
- *Salix amygdaloides* Andersson – peachleaf willow
- *Salix arbuscula* L.
- *Salix arbusculoides* – littletree willow
- *Salix arctica* Pall. – Arctic willow
- *Salix arizonica* Dorn
- *Salix atrocinerea* Brot. – grey willow
- *Salix aurita* L. – eared willow
- *Salix babylonica* L. – Babylon willow, Peking willow or weeping willow

- *Salix bakko*
- *Salix barclayi* Andersson
- *Salix barrattiana* – Barratt's willow
- *Salix bebbiana* Sarg. – beaked willow, long-beaked willow, and Bebb's willow
- *Salix bicolor*
- *Salix bonplandiana* Kunth – Bonpland willow
- *Salix boothii* Dorn – Booth's willow
- *Salix brachycarpa* Nutt.
- *Salix breweri* Bebb – Brewer's willow
- *Salix canariensis* Chr. Sm.
- *Salix candida* Flüggé ex Willd. – sageleaf willow
- *Salix caprea* L. – goat willow, pussywillow or willow
- *Salix caroliniana* Michx. – coastal plain willow
- *Salix chaenomeloides* Kimura
- *Salix cinerea* L. – grey willow
- *Salix cordata* Michx. – sand dune willow, furry willow, or heartleaf willow
- *Salix delnortensis* C.K.Schneid. – Del Norte willow
- *Salix discolor* Muhl. – American willow
- *Salix drummondiana* Barratt ex Hook. – Drummond's willow
- *Salix eastwoodiae* Cockerell ex A.Heller – Eastwood's willow, mountain willow, or Sierra willow
- *Salix eleagnos* Scop. - olive willow
- *Salix eriocarpa*
- *Salix exigua* Nutt. – sandbar willow, narrowleaf willow, or coyote willow
- *Salix floridana*
- *Salix fragilis* L. – crack willow
- *Salix fuscescens* - Alaska bog willow
- *Salix futura*
- *Salix geyeriana* Andersson – Geyer's willow
- *Salix gilgiana* Seemen
- *Salix glauca* L.
- *Salix glaucosericea*
- *Salix gooddingii* C. R. Ball – Goodding's willow, or Goodding's black willow
- *Salix gracilistyla* Miq.
- *Salix hastata* L.
- *Salix herbacea* L. – dwarf willow, least willow or snowbed willow
- *Salix hookeriana* Barratt ex Hook. – dune willow, coastal willow, or Hooker's willow

- *Salix hultenii*
- *Salix integra* Thunb.
- *Salix interior*
- *Salix japonica* Thunb.
- *Salix jepsonii* C.K.Schneid. – Jepson's willow
- *Salix jessoensis* Seemen
- *Salix koriyanagi* Kimura ex Goerz
- *Salix kusanoi*
- *Salix laevigata* Bebb – red willow or polished willow
- *Salix lanata* L. – woolly willow
- *Salix lapponum* L. - downy willow
- *Salix lasiolepis* Benth. – arroyo willow
- *Salix lemmonii* Bebb – Lemmon's willow
- *Salix libani* – Lebanese willow
- *Salix ligulifolia* C.R.Ball – strapleaf willow
- *Salix lucida* Muhl. – shining willow, Pacific willow, or whiplash willow
- *Salix lutea* Nutt. – yellow willow
- *Salix magnifica* Hemsl.
- *Salix matsudana* Koidz. – Chinese willow or twisted willow, variant *Corkscrew*
- *Salix melanopsis* Nutt. – dusky willow
- *Salix miyabeana* Seemen
- *Salix monticola*
- *Salix mucronata* - Cape silver willow
- *Salix myrsinifolia* Salisb.
- *Salix myrtillifolia*
- *Salix myrtilloides* L. – swamp willow
- *Salix nakamurana*
- *Salix nigra* Marshall – black willow
- *Salix orestera* C.K.Schneid. – Sierra willow or gray-leafed Sierra willow
- *Salix pentandra* L. – bay willow
- *Salix phylicifolia* L.
- *Salix planifolia* Pursh. – diamondleaf willow or tea-leafed willow
- *Salix polaris* Wahlenb. – polar willow
- *Salix prolixa* Andersson – MacKenzie's willow
- *Salix pulchra*
- *Salix purpurea* L. – purple willow or purple osier

- *Salix reinii*
- *Salix reticulata* L. – net-veined willow
- *Salix retusa*
- *Salix richardsonii*
- *Salix rorida* Lacksch.
- *Salix rupifraga*
- *Salix schwerinii* E. L. Wolf
- *Salix scouleriana* Barratt ex Hook. – Scouler's willow
- *Salix sepulcralis* group – hybrid willows
- *Salix sericea* Marshall – silky willow
- *Salix serissaefolia*
- *Salix serissima* (L. H. Bailey) Fernald —autumn willow or fall willow
- *Salix serpyllifolia*
- *Salix sessilifolia* Nutt. – northwest sandbar willow
- *Salix shiraii*
- *Salix sieboldiana*
- *Salix sitchensis* C. A. Sanson ex Bong. – Sitka willow
- *Salix subfragilis*
- *Salix subopposita* Miq.
- *Salix taraikensis*
- *Salix tarraconensis*
- *Salix taxifolia* Kunth – yew-leaf willow
- *Salix tetrasperma* Roxb. – Indian willow
- *Salix triandra* L. – almond willow or almond-leaved willow
- *Salix udensis* Trautv. & C. A. Mey.
- *Salix viminalis* L. – common osier
- *Salix vulpina* Andersson
- *Salix yezoalpina* Koidz.
- *Salix yoshinoi*

53.9 See also

- *Aravah*, the Hebrew name of the willow, for its ritual use during the Jewish Feast of Tabernacles;
- List of Lepidoptera that feed on willows
- *Rhabdophaga rosaria*, a willow gall;
- Willow Biomass Project;
- Willow water, using willow branches to grow roots of new cuttings - extracting biological rooting hormones indolebutyric acid and salicylic acid;
- Sail ogham letter meaning willow.

53.10 References

[1] "Genus **Salix (willows)**". *Taxonomy*. UniProt. Retrieved 2010-02-04.

[2] Mabberley, D.J. 1997. The Plant Book, Cambridge University Press #2: Cambridge.

[3] George W. Argus. *The Genus* Salix *(Salicaceae) in the Southeastern United States*. Systematic Botany Monographs **9**.

[4] Leland, John (2005) *Aliens in the Backyard: Plant and Animal Imports into America*, p. 70. Univ of South Carolina Press. At Google Books. Retrieved 11 August 2013.

[5] Laird, Mark (1999) *The Flowering of the Landscape Garden: English Pleasure Grounds, 1720-1800*, p. 403. University of Pennsylvania Press At Google Books. Retrieved 11 August 2013.

[6] "RHS Plant Selector - *Salix* 'Boydii'". Retrieved 2 June 2013.

[7] "Mourning Cloak". Study of Northern Virginia Ecology. Fairfax County Public Schools.

[8] Albury/Wodonga Willow Management Working Group (December 1998). "Willows along watercourses: managing, removing and replacing". Department of Primary Industries, State Government of Victoria.

[9] Cremer, Kurt W. (2003). "Introduced willows can become invasive pests in Australia" (PDF).

[10] Salix spp. UFL/edu, *Weeping Willow* Fact Sheet ST-576, Edward F. Gilman and Dennis G. Watson, United States Forest Service

[11] "Rooting Around: Tree Roots", Dave Hanson, *Yard & Garden Line News* Volume 5 Number 15, University of Minnesota Extension, October 1, 2003

[12] Blackman, R. L.; Eastop, V. F. (1994). *Aphids on the World's Trees*. CABI. ISBN 9780851988771.

[13] David V. Alford (2012). *Pests of Ornamental Trees, Shrubs and Flowers*. p. 78.

[14] Kenaley, Shawn C. et al. (2010). "Leaf Rust" (PDF).

[15] James Breasted (English translation). "The Edwin Smith Papyrus". Retrieved 2007-06-09.

[16] "An aspirin a day keeps the doctor at bay: The world's first blockbuster drug is a hundred years old this week". Retrieved 2007-06-09.

[17] W. Hale White. "Materia Medica Pharmacy, Pharmacology and Therapeutics". Retrieved 2011-04-02.

[18] D. S. Vohra (1 June 2004). *Bach Flower Remedies: A Comprehensive Study*. B. Jain Publishers. p. 3. ISBN 978-81-7021-271-3. Retrieved 2 September 2013.

[19] "Flower remedies". Cancer Research UK. Retrieved September 2013.

[20] The palaeoenvironment of the Antrea Net Find The Department of Geography, University of Helsinki

[21] Hageneder, Fred (2001). *The Heritage of Trees*. Edinburgh : Floris. ISBN 0-86315-359-3. p.172

[22] Aylott, Matthew J.; Casella, E; Tubby, I; Street, NR; Smith, P; Taylor, G (2008). "Yield and spatial supply of bioenergy poplar and willow short-rotation coppice in the UK" (PDF). *New Phytologist* **178** (2): 358–370. doi:10.1111/j.1469-8137.2008.02396.x. PMID 18331429. Retrieved 2008-10-22.

[23] Mola-Yudego, Blas; Aronsson, Pär. (2008). "Yield models for commercial willow biomass plantations in Sweden" (PDF). *Biomass and Bioenergy* **32** (9): 829–837. doi:10.1016/j.biombioe.2008.01.002. Retrieved 2009-11-20.

[24] "Forestresearch.gov.uk". Forestresearch.gov.uk. Retrieved 2011-12-18.

[25] "ChurchYear.net". ChurchYear.net. Retrieved 2011-12-18.

[26] Doolittle, Justus (2002) [1876]. *Social Life of the Chinese*. Routledge. ISBN 978-0-7103-0753-8.

[27] Doré S.J., Henry; Kennelly, S.J. (Translator), M. (1914). *Researches into Chinese Superstitions*. Tusewei Press, Shanghai. Vol I p. 2

[28] "The Forest of Willows in Our Minds". Arirang TV. August 20, 2007. Retrieved September 10, 2007. Check date values in: |date= (help)

[29] "In Worship of Trees by George Knowles: Willow".

[30] "Mythology and Folklore of the Willow".

[31] "Under The Willow Tree". Hca.gilead.org.il. 2007-12-13. Retrieved 2011-12-18.

[32] "Green Willow". Spiritoftrees.org. Retrieved 2011-12-18.

[33] The Willow Wife

[34] "Wisdom of the Willow Tree". Tweedsblues.net. Retrieved 2011-12-18.

53.11 Bibliography

- Keeler, Harriet L. (1990). *Our Native Trees and How to Identify Them.* New York: Charles Scriber's Sons. Pages 393–395. ISBN 0-87338-838-0.
- Newsholme, C. (1992). *Willows: The Genus Salix*. ISBN 0-88192-565-9
- Warren-Wren, S.C. (1992). *The Complete Book of Willows*. ISBN 0-498-01262-X
- Sviatlana Trybush, Šárka Jahodová, William Macalpine and Angela Karp. (2008). *A genetic study of a* Salix *germplasm resource reveals new insights into relationships among subgenera, sections and species* BioEnergy Research. 1(1):67 – 79.

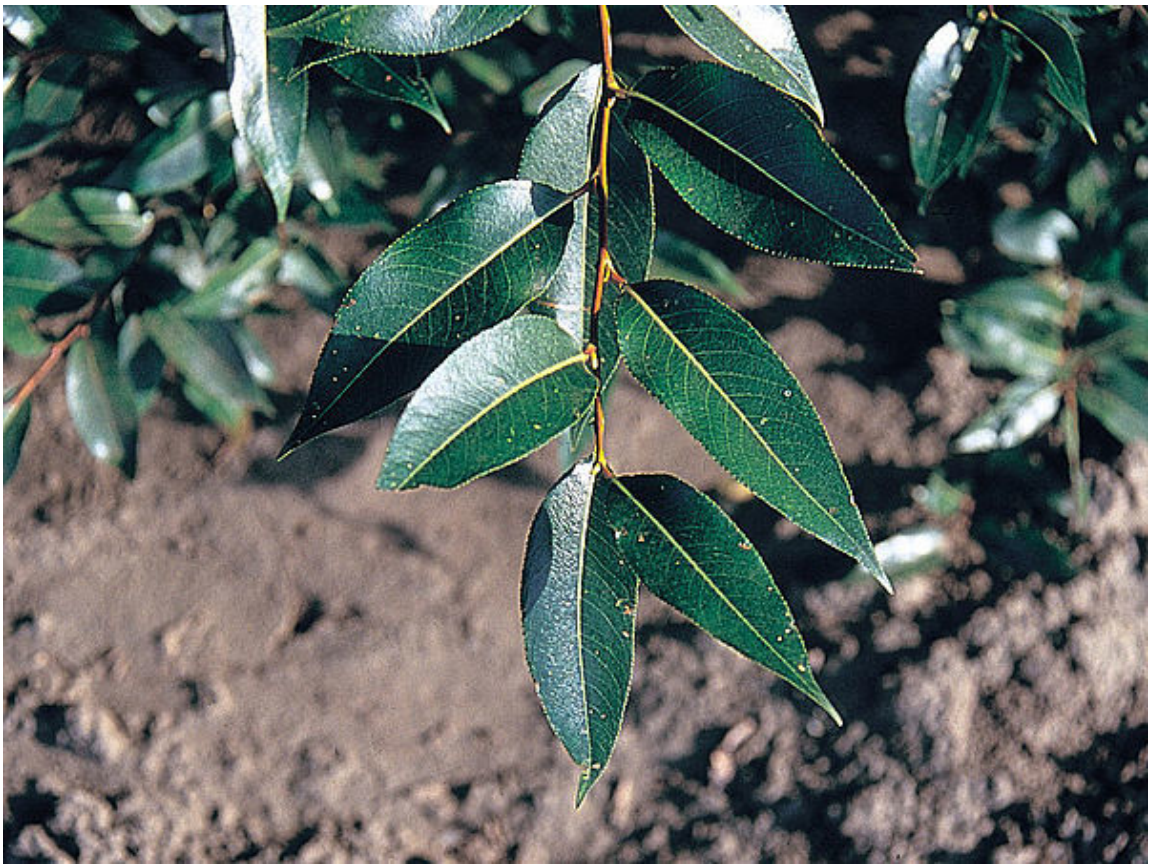
53.12 External links

- 1911 Encyclopaedia Britannica
- "Willow". *The New Student's Reference Work*. 1914.

Chapter 54

Salix pentandra

Salix pentandra (**bay willow**) is a species of willow native to northern Europe and northern Asia.*[1]



Leaves

It is a large shrub or small tree growing to 14 m (46 ft) tall (rarely to 17 m), usually growing in wet, boggy ground. The leaves are glossy dark green, 5-12 cm long and 2-5 cm broad, with finely serrated margins. The dioecious flowers are catkins, produced in late spring after the leaves; the male catkins are yellow, 2-5 cm long, the female catkins greenish, 1.5-3 cm long; they are pollinated by bees. The fruit is a small capsule containing numerous minute seeds embedded in white down which aids wind dispersal.*[1]*[2]

The scientific name refers to the male flowers having five stamens. The English name derives from the resemblance of the leaves to those of the bay laurel; other common names include bay-leaved willow and laurel willow. Its glossy leaves make it more decorative than many other willows, so it is often planted as an ornamental tree.*[1]

It has become locally naturalised in northern North America, and is widely known as laurel-leaf willow there.

54.1 References

[1] Rushforth, K. (1999). *Trees of Britain and Europe*. Collins ISBN 0-00-220013-9.

[2] Mitchell, A. F. (1974). *A Field Guide to the Trees of Britain and Northern Europe*. Collins ISBN 0-00-212035-6

Chapter 55

Salix fragilis

Salix fragilis, with the common names **crack willow** or **brittle willow**, is a species of willow native to Europe and Western Asia. It is native to riparian habitats, usually found growing beside rivers and streams, and in marshes and water meadow channels.*[1]*[2]*[3]

55.1 Description

Salix fragilis is a medium-sized to large deciduous tree, which grows rapidly to 10–20 m (33–66 ft) (rarely to 29 m (95 ft)) tall, with a trunk up to 1 m (3.3 ft) diameter, often multi-trunked, and an irregular, often leaning crown. The bark is dark grey-brown, coarsely fissured in older trees. The lanceolate leaves are bright green, 9–15 cm long and 1.5–3 cm wide, with a finely serrated margin; they are very finely hairy at first in spring, but soon become hairless.*[3]

The flowers are produced in catkins in early spring, and pollinated by insects. They are dioecious, with male and female catkins on separate trees; the male catkins are 4–6 cm long, the female catkins are also 4–6 cm long, with the individual flowers having either one or two nectaries.*[1]*[2]*[4] In late spring fruit capsules release numerous small cotton-tufted seeds. They are easily distributed by wind and moving water, and germinate immediately after soil contact.*[3]

55.1.1 Taxonomy

The variety *Salix fragilis* var. *decipiens* (Hoffm.) K. Koch occurs frequently with the type. It is a smaller shrubby tree, rarely exceeding 5–7 m (16–23 ft) tall, with completely hairless leaves up to 9 cm long and 2–3 cm broad. According to some botanists, it is a distinct species (treated as *Salix decipiens* Hoffm.), with, in this view, *S. fragilis* then being a hybrid between *S. decipiens* and *S. alba*. Some other botanists regard *S. decipiens* as itself being a hybrid between *S. fragilis* and *S. triandra*. Llittle evidence supports either of these suggestions.*[1]

It readily forms natural hybrids with white willow *S. alba* in Europe and Asia, the hybrid being named *Salix* × *rubens* Schrank.*[1] It can also hybridize with the native *Salix nigra* (black willow) in eastern North America.*[3]

55.2 Ecology

The plant is commonly called crack willow or brittle willow because it is highly susceptible to wind, ice and snow damage.*[3] The name also derives from the twigs which break off very easily and cleanly at the base with an audible crack. Broken twigs and branches can take root readily, enabling the species to colonise new areas as broken twigs fall into waterways and can be carried some distance downstream. It is particularly adept at colonising new riverside sandbanks formed after floods. It also spreads by root suckers, expanding into pure 'groves'.*[3]

Salix fragilis *in native riparian habitat, Hesse, Germany.*

55.3 Cultivation

Salix fragilis is cultivated as a fast-growing ornamental tree. The cultivar *Salix fragilis* 'Russelliana' (syn. *S. fragilis* var. *russelliana* (Sm.) Koch) is by far the commonest clone of crack willow in Great Britain and Ireland, very easily propagated by cuttings. It is a vigorous tree commonly reaching 20–25 m (66–82 ft) tall, with leaves up to 15 cm long. It is a female clone.*[1]

55.4 Invasive species

S. fragilis has escaped cultivation to become an invasive species in various parts of the world,[*][5] including: New Zealand; the upper half of the United States;[*][3][*][6] and South Africa.[*][7] In New Zealand it is listed on the National Pest Plant Accord, which means it cannot be sold or distributed. It can replace a habitat's native plant species diversity, by forming 'monoculture groves'. As only the male plant is present in New Zealand no fruit are formed unless hybridised.[*][8] Species spread is facilitated by stem Fragmentation (reproduction) which are carried via waterways. Control and management for habitat restoration projects often uses herbicides.[*][3]

55.5 References

[1] Meikle, R. D. (1984). *Willows and Poplars of Great Britain and Ireland*. BSBI Handbook No. 4. ISBN 0-901158-07-0.

[2] Rushforth, K. (1999). *Trees of Britain and Europe*. Collins ISBN 0-00-220013-9.

[3] USFS—United States Forest Service: *Salix fragilis* — "Weed of the Week" . accessed 1.13.2013

[4] Bean, W. J. (1980). *Trees and Shrubs Hardy in the British Isles* 8th ed., vol. 4. John Murray ISBN 0-7195-2428-8.

[5] Invasive.org Salix fragilis (crack willow) . accessed 1.13.2013

[6] U.S. states with invasive *S. fragilis* sites include: CN, CO, ID, IL, IN, IO, MA, MI, MN, MO, NB, ND, NJ, OH, OR, NH, NM, NV, NY, PA, RI, SD, UT, VA, VT, WA, WI, WV, and WY. (USFS & invasive.org)

[7] http://www.capetowngreenmap.co.za/go-green/plant-indigenous-garden

[8] http://www.biosecurity.govt.nz/pests/crack-willow

55.6 External links

- USDA Plants Profile for *Salix fragilis* (crack willow)
- USFS—United States Forest Service: *Salix fragilis* — "Weed of the Week"
- Center for Invasive Species and Ecosystem Health—Invasive.org —*photos gallery*.

Chapter 56

Salix alba

"White Willow" redirects here. For the Norwegian band, see White Willow (band).
"Golden Willow" redirects here. For the horse, see Golden Willow (horse).

Salix alba (**white willow**) is a species of willow native to Europe and western and central Asia.[*][1][*][2] The name derives from the white tone to the undersides of the leaves.

It is a medium-sized to large deciduous tree growing up to 10–30 m tall, with a trunk up to 1 m diameter and an irregular, often-leaning crown. The bark is grey-brown, and deeply fissured in older trees. The shoots in the typical species are grey-brown to green-brown. The leaves are paler than most other willows, due to a covering of very fine, silky white hairs, in particular on the underside; they are 5–10 cm long and 0.5–1.5 cm wide. The flowers are produced in catkins in early spring, and pollinated by insects. It is dioecious, with male and female catkins on separate trees; the male catkins are 4–5 cm long, the female catkins 3–4 cm long at pollination, lengthening as the fruit matures. When mature in midsummer, the female catkins comprise numerous small (4 mm) capsules, each containing numerous minute seeds embedded in white down, which aids wind dispersal.[*][1][*][2][*][3]

56.1 Ecology

White willows are fast-growing, but relatively short-lived, being susceptible to several diseases, including watermark disease caused by the bacterium *Brenneria salicis* (named because of the characteristic 'watermark' staining in the wood; syn. *Erwinia salicis*) and willow anthracnose, caused by the fungus *Marssonina salicicola*. These diseases can be a serious problem on trees grown for timber or ornament.

It readily forms natural hybrids with crack willow *Salix fragilis*, the hybrid being named *Salix* × *rubens* Schrank.[*][1]

56.2 Uses

The wood is tough, strong, and light in weight, but has minimal resistance to decay. The stems (withies) from coppiced and pollarded plants are used for basket-making. Charcoal made from the wood was important for gunpowder manufacture. The bark tannin was used in the past for tanning leather.[*][1][*][2] The wood is used to make cricket bats. S. alba's wood has a low density and a lower transverse compressive strength. This allows the wood to bend, which is why it can be used to make baskets.

56.2.1 Cultivars and hybrids

A number of cultivars and hybrids have been selected for forestry and horticultural use:[*][1][*][2]

- *Salix alba* 'Caerulea' (**cricket-bat willow**; syn. *Salix alba* var. *caerulea* (Sm.) Sm.; *Salix caerulea* Sm.) is grown as a specialist timber crop in Britain, mainly for the production of cricket bats, and for other uses where

Tree showing whitish foliage compared to surrounding trees

a tough, lightweight wood that does not splinter easily is required. It is distinguished mainly by its growth form, very fast-growing with a single straight stem, and also by its slightly larger leaves (10–11 cm long, 1.5–2 cm wide) with a more blue-green colour. Its origin is unknown; it may be a hybrid between white willow and crack willow, but this is not confirmed.*[1]

- *Salix alba* 'Vitellina' (**golden willow**; syn. *Salix alba* var. *vitellina* (L.) Stokes) is a cultivar grown in gardens for its shoots, which are golden-yellow for one to two years before turning brown. It is particularly decorative in winter; the best effect is achieved by coppicing it every two to three years to stimulate the production of longer young shoots with better colour. Other similar cultivars include 'Britzensis', 'Cardinal', and 'Chermesina', selected for even brighter orange-red shoots.

- *Salix alba* 'Sericea' (**silver willow**) is a cultivar where the white hairs on the leaves are particularly dense, giving it more strongly silvery-white foliage. This cultivar has gained the Royal Horticultural Society's Award of Garden Merit.*[4]

- *Salix alba* 'Vitellina-Tristis' (**golden weeping willow**, synonym 'Tristis') is a weeping cultivar with yellow branches that become reddish-orange in winter. It is now rare in cultivation and has been largely replaced by *Salix sepulcralis* 'Chrysocoma'. It is, however, still the best choice in very cold parts of the world, such as Canada, the northern US, and Russia.

- The **golden hybrid weeping willow** (*Salix sepulcralis* 'Chrysocoma') is a hybrid between white willow and Peking willow *Salix babylonica*.

56.2.2 Medicinal uses

Hippocrates, Galen, Pliny the Elder and others knew willow bark could ease aches and pains and reduce fevers.*[5] It has long been used in Europe and China for the treatment of these conditions.*[6] This remedy is also mentioned in texts from ancient Egypt, Sumer, and Assyria.*[7] The Reverend Edward Stone, a vicar from Chipping Norton

in Oxfordshire, England, noted in 1763 that willow bark was effective in reducing a fever.*[8] The bark is often macerated in ethanol to produce a tincture.

The active extract of the bark, called salicin, after the Latin name *Salix*, was isolated to its crystalline form in 1828 by Henri Leroux, a French pharmacist, and Raffaele Piria, an Italian chemist, who then succeeded in separating out the acid in its pure state. Salicylic acid, like aspirin, is a chemical derivative of salicin.

56.3 References

[1] Meikle, R. D. (1984). *Willows and Poplars of Great Britain and Ireland*. BSBI Handbook No. 4. ISBN 0-901158-07-0.

[2] Rushforth, K. (1999). *Trees of Britain and Europe*. Collins ISBN 0-00-220013-9.

[3] Mitchell, A. F. (1974). *A Field Guide to the Trees of Britain and Northern Europe*. Collins ISBN 0-00-212035-6

[4] "RHS Plant Selector - *Salix alba* 'Sericea'". Retrieved 2 June 2013.

[5] Norn, S.; Permin, H.; Kruse, P. R.; Kruse, E. (2009). "[From willow bark to acetylsalicylic acid]". *Dansk Medicinhistorisk Årbog* (in Danish) **37**: 79–98. PMID 20509453.

[6] "Willow bark". *University of Maryland Medical Center*. University of Maryland. Retrieved 19 December 2011.

[7] Seaman, David R. (19 July 2011). "White Willow Bark: The Oldest New Natural Anti-Inflammatory/Analgesic Agent". *The American Chiropractor*. Retrieved 19 December 2011.

[8] Stone, E. (1763). An Account of the Success of the Bark of the Willow in the Cure of Agues. *Philosophical Transactions of the Royal Society of London* 53.

56.4 Further Reading

Morader, H. L.; Prego, I. A.; Facciuto, G. R.; Maldonado, S. B. (November 2000). "Storage Behavior of Salix alba and Salix matsudana Seeds". *Annals of Botany* **86** (5): 1017-1021. doi:10.1006/anbo.2000.1265. Retrieved 24 April 2015.

van Casteren, A.; Sellers, W. I.; Thorpe, S. K. S. (23 November 2011). "Why don't branches snap? The mechanics of bending failure in three temperate angiosperm trees". *Trees* **26** (3): 789–797.

Vennetier, Michel (February 2015). "Tree root architecture: new insights from a comprehensive study on dikes" **387** (1-2). p. 81-101. doi:10.1007/s11104-014-2272-9. Retrieved 29 April 2015.

56.5 External links

Media related to Salix alba at Wikimedia Commons

Chapter 57

Salix triandra

Salix triandra, with the common names **almond willow** or **almond-leaved willow**, is a species of willow native to Europe and Western and Central Asia. It is found from southeastern England east to Lake Baikal, and south to Spain and the Mediterranean east to the Caucasus, and the Alborz Mountains. It usually grows in riparian habitats, on river and stream banks, and in wetlands.*[1]*[2]*[3]

57.1 Description

Salix triandra is a deciduous shrub or small tree growing to 10 m (33 ft) tall, usually multistemmed, with an irregular, often leaning crown. Young bark is smooth grey-brown, becoming scaly on older stems with large scales exfoliating (like a plane tree) to leave orange-brown patches. The leaves are broad, lanceolate, 4–11 cm long and 1–3 cm wide, with a serrated margin; they are dull dark green above and green to glaucous-green below, with a 1–2-cm petiole with two conspicuous basal stipules.

The flowers are produced in catkins in early spring at the same time as the new leaves, and pollinated by insects. They are dioecious, with male and female catkins on separate trees; the male catkins are 2.5–8 cm long, the female catkins 2–4 cm long. The male flowers have three stamens, a useful identification feature with most other willows having two or five stamens.*[1]*[2]

57.2 Taxonomy

The scientific name derives from the male flowers having three stamens. The English common name refers to the similarity in leaf shape to almond leaves.

The variety *Salix triandra* var. *hoffmanniana* Bab., found in Great Britain, is distinguished by being smaller (rarely over 4 m (13 ft) tall) and densely branched, with smaller leaves 2–7 cm long and 1-2.5 cm wide not glaucous below. It is not considered distinct by all authorities, particularly on continental Europe, so its range outside Britain, if any, is not reported.*[1]

Salix triandra readily forms natural hybrids with *Salix viminalis*, the hybrid being named *Salix* × *mollissima* Hoffm. ex Elwert.*[1]

Plants from Eastern Asia, formerly treated as *S. triandra* var. *nipponica* (Franch. & Savatier) Seem.,*[3] are now considered the distinct species *Salix nipponica*. They share the feature of male flowers with three stamens.*[4]

57.3 Cultivation and uses

The plant is a potential biomass source for biofuel energy generation.*[5]

In the Russian honey industry, the plant is used as a nectar source for honeybees.*[5]

Basket weaving

Salix triandra —*bark.*

The shoots (withies) are extensively used for basketmaking. It is one of the most important willows for this purpose after *Salix viminalis*, with several selected cultivars including: 'Black Maul', 'Grizette', 'Mottled Spaniards', 'Sarda', and 'Yellow Dutch'.*[1]

Woven withies have been used in the creation of the large outdoor sculpture "Willow Man", located near Bridgwater in England.

57.4 References

[1] Meikle, R. D. (1984). *Willows and Poplars of Great Britain and Ireland*. BSBI Handbook No. 4. ISBN 0-901158-07-0.

[2] Rushforth, K. (1999). *Trees of Britain and Europe*. Collins ISBN 0-00-220013-9.

[3] Den Virtuella Floran: *Salix triandra* (in Swedish; with maps)

[4] Flora of China: *Salix nipponica*

[5] NPGS . accessed 1.13.2013

57.5 External links

- *Salix triandra* information from NPGS/GRIN
- USDA Plants: *Salix triandra* —*photo gallery*.

Chapter 58

Taxaceae

Taxaceae /tækˈseɪsiː/, commonly called the **yew** family, is a coniferous family which includes seven genera and about 30 species of plants, or in older interpretations three genera and 7 to 12 species.

They are many-branched, small trees and shrubs. The leaves are evergreen, spirally arranged, often twisted at the base to appear 2-ranked. They are linear to lanceolate, and have pale green or white stomatal bands on the undersides. The plants are dioecious, rarely monoecious. The male cones are 2–5 millimetres (0.079–0.197 in) long, and shed pollen in the early spring. The female cones are highly reduced, with just one ovuliferous scale and one seed. As the seed matures, the ovuliferous scale develops into a fleshy **aril** partly enclosing the seed. The mature aril is brightly coloured, soft, juicy and sweet, and is eaten by birds which then disperse the hard seed undamaged in their droppings. However, the seeds are highly poisonous to humans, containing the poisons taxine and taxol.*[3]

58.1 Classification

Taxaceae is now generally included with all other conifers in the order **Pinales**, as DNA analysis has shown that the yews are monophyletic with the other families in the Pinales (Chase *et al.*, 1993; Price, 2003), a conclusion supported by micromorphology studies (Anderson & Owens, 2003). Formerly they were often treated as distinct from other conifers by placing them in a separate order Taxales. Ernest Henry Wilson referred to **Taxaceae** as *taxad* in his book ” 1916, Conifers and taxads of Japan” .*[4]

Some studies in the early 2000s suggested the genera *Torreya* and *Amentotaxus* were better transferred to Cephalotaxaceae, as genetic tests showed they are were more closely related to *Cephalotaxus* than to *Taxus*. More recent studies have included, with *Cephalotaxus*, in a broader interpretation of Taxaceae as a single larger family (Price, 2003). In this sense, the Taxaceae includes six genera and about 30 species.

The differences suggested between Taxaceae and Cephalotaxaceae were based on the morphology of the seeds, with Taxaceae having smaller mature seeds growing to 5–8 millimetres (0.20–0.31 in) in 6-8 months and not being fully enclosed by the aril. Cephalotaxaceae seeds show a longer maturation period, ranging from 18-20 months, with the mature seeds fully enclosed in the aril and ranging from 12–40 millimetres (0.47–1.57 in).

A few botanists have transferred *Austrotaxus* to its own family, the **Austrotaxaceae**, suggesting it may be closer to the **Podocarpaceae** than to the other Taxaceae, but genetic evidence does not support this transfer.

58.2 References

- Anderson, E. & Owens, J. N. (2003). Analysing the reproductive biology of Taxus: should it be included in Coniferales? *Acta Hort.* 615: 233-234. (conclusion is 'yes')
- Chase, M. W. *et al.* (1993). Phylogenetics of seed plants, an analysis of nucleotide sequences from the plastid gene *rbc*L. *Ann. Missouri Bot. Gard.* 80: 528-580.
- Price, R. A. (2003). Generic and familial relationships of the Taxaceae from *rbc*L and *mat*K sequence comparisons. *Acta Hort.* 615: 235-237.

58.3 Footnotes

[1] Manchester, S.R. (1994). "Fruits and Seeds of the Middle Eocene Nut Beds Flora, Clarno Formation, Oregon". *Palaeontographica Americana* **58**: 30-31.

[2] Christenhusz, J. M. M.; Reveal, J. L.; Martin, F. G.; Robert, R. M.; Chase, W. M. (2011). "Linear sequence, classification, synonymy, and bibliography of vascular plants: Lycophytes, ferns, gymnosperms and angiosperms" (PDF). *Phytotaxa* **19**: 1–134.

[3] Yew Poisoning: MedLine Plus Medical Encyclopedia

[4] taxad (plant family) : see Taxaceae; britannica

Chapter 59

Taxus baccata

Taxus baccata is a conifer native to western, central and southern Europe, northwest Africa, northern Iran and southwest Asia.*[1] It is the tree originally known as **yew**, though with other related trees becoming known, it may now be known as **English yew**, or **European yew**.

59.1 Taxonomy and naming

The word *yew* is from Proto-Germanic **īwa-*, possibly originally a loanword from Gaulish **ivos*, compare Irish *ēo*, Welsh *ywen*, French *if* (see Eihwaz for a discussion). *Baccata* is Latin for *bearing red berries*. The word *yew* as it was originally used seems to refer to the color brown.*[2] The yew (μίλος) was known to Theophrastus, who noted its preference for mountain coolness and shade, its evergreen character and its slow growth.*[3]

Most romance languages, with the notable exception of French, kept a version of the Latin word *taxus* (Italian *tasso*, Corsican *tassu*, Occitan *teis*, Catalan *teix*, Gasconic *tech*, Spanish *tejo*, Portuguese *teixo*, Galician *teixo* and Romanian *tisă*) from the same root as *toxic*. In Slavic languages, the same root is preserved: Russian *tiss* (*muc*), Slovakian *tis*, Slovenian *tisa*, Bosnian *tisa* (*muca*). In Albanian it is named *tis*.

The common yew was one of the many species first described by Linnaeus. It is one of around 30 other conifer species in seven genera in the family Taxaceae, which is placed in the order Pinales.

59.2 Description

It is a small to medium-sized evergreen tree, growing 10–20 metres (33–66 ft) (exceptionally up to 28 metres (92 ft)) tall, with a trunk up to 2 metres (6 ft 7 in) (exceptionally 4 metres (13 ft)) diameter. The bark is thin, scaly brown, coming off in small flakes aligned with the stem. The leaves are flat, dark green, 1–4 centimetres (0.39–1.57 in) long and 2–3 millimetres (0.079–0.118 in) broad, arranged spirally on the stem, but with the leaf bases twisted to align the leaves in two flat rows either side of the stem, except on erect leading shoots where the spiral arrangement is more obvious. The leaves are poisonous.*[1]*[4]

The seed cones are modified, each cone containing a single seed, which is 4–7 millimetres (0.16–0.28 in) long, and partly surrounded by a modified scale which develops into a soft, bright red berry-like structure called an aril. The aril is 8–15 millimetres (0.31–0.59 in) long and wide and open at the end. The arils mature 6 to 9 months after pollination, and with the seed contained, are eaten by thrushes, waxwings and other birds, which disperse the hard seeds undamaged in their droppings. Maturation of the arils is spread over 2 to 3 months, increasing the chances of successful seed dispersal. The seeds themselves are poisonous and bitter, but are opened and eaten by some bird species including Hawfinches,*[5] Greenfinches and Great Tits.*[6] The aril is not poisonous, but is gelatinous and very sweet tasting. The male cones are globose, 3–6 millimetres (0.12–0.24 in) diameter, and shed their pollen in early spring. The yew is mostly dioecious, but occasional individuals can be variably monoecious, or change sex with time.*[1]*[4]*[7]

Seeds of Taxus baccata

59.3 Longevity

Taxus baccata can reach 400 to 600 years of age. Some specimens live longer but the age of yews is often overestimated.*[8] Ten yews in Britain are believed to predate the 10th century.*[9] The potential age of yews is impossible to determine accurately and is subject to much dispute. There is rarely any wood as old as the entire tree, while the boughs themselves often become hollow with age, making ring counts impossible. There are claims as high as 5,000–9,500 years,*[10] but other evidence based on growth rates and archaeological work of surrounding structures suggests the oldest trees (such as the Fortingall Yew in Perthshire, Scotland) are more likely to be in the range of 2,000 years.*[11]*[12] Even with this lower estimate, *Taxus baccata* is one of the longest-living plants in Europe. One characteristic contributing to its longevity is that it is able to split under the weight of advanced growth without succumbing to disease in the fracture, as do most other trees. Another is its ability to give rise to new epicormic and basal shoots from cut surfaces and low on its trunk, even at an old age.

59.4 Significant trees

The Fortingall Yew in Perthshire, Scotland, has the largest recorded trunk girth in Britain and experts estimate it to be 2,000 to 3,000 years old, although it may be a remnant of a post-Roman Christian site and around 1,500 years old.*[13] The Llangernyw Yew in Clwyd, Wales, can be found at an early saint site and is about 1,500 years old.*[14] Other well known yews include the Ankerwycke Yew, the Balderschwang Yew, the Caesarsboom, the Florencecourt Yew, and the Borrowdale Fraternal Four, of which poet William Wordsworth wrote. The Kingley Vale National Nature Reserve in West Sussex has one of Europe's largest yew woodlands.

The oldest specimen in Spain is located in Bermiego, Asturias. It is known as *Teixu l'Iglesia* in the Asturian language. It stands 15 m (49 ft) tall with a trunk diameter of 6.82 m (22.4 ft) and a crown diameter of 15 m. It was declared a Natural Monument on April 27, 1995 by the Asturian Government and is protected by the Plan of Natural Resources.*[15]

A unique forest formed by *Taxus baccata* and European Box (*Buxus sempervirens*) lies within the city of Sochi, in

The Llangernyw Yew

the Western Caucasus.

59.5 Allergenic potential

Yews in this genus are primarily separate-sexed, and males are extremely allergenic, with an OPALS allergy scale rating of 10 out of 10. Completely female yews have an OPALS rating of 1, and are considered "allergy-fighting". [*][16] Male yews bloom and release abundant amounts of pollen in the spring; completely female yews only trap pollen while producing none.[*][16]

59.6 Toxicity

All parts of a yew plant are toxic to humans with the exception of the yew berries (however, their seeds are toxic); additionally, male and monoecious yews in this genus release cytotoxic pollen, which can cause headaches, lethargy, aching joints, itching, and skin rashes; it is also a trigger for asthma.[*][17][*][16] These pollen granules are extremely small, and can easily pass through window screens.[*][16]

The foliage itself remains toxic even when wilted, and toxicity increases in potency when dried.[*][18] Ingestion and subsequent excretion by birds whose beaks and digestive systems do not break down the seed's coating are the primary means of yew dispersal.[*][19] The major toxin within the yew is the alkaloid taxine.[*][20] Horses have a relatively low tolerance to taxine, with a lethal dose of 200–400 mg/kg body weight; cattle, pigs, and other livestock are only slightly less vulnerable.[*][21] Several studies[*][22] have found taxine LD_{50} values under 20 mg/kg in mice and rats.

Symptoms of yew poisoning include an accelerated heart rate, muscle tremors, convulsions, collapse, difficulty breathing, circulation impairment and eventually heart failure. However, there may be no symptoms, and if poisoning remains undetected death may occur within hours.[*][23] Fatal poisoning in humans is very rare, usually occurring after consuming yew foliage. The leaves are more toxic than the seed.[*][20]

Estry Yew, Normandy, around 1,600 years old

59.7 Uses and traditions

One of the world's oldest surviving wooden artifacts is a Clactonian yew*[24] spear head, found in 1911 at Clacton-on-Sea, in Essex, UK. It is estimated to be about 450,000 years old.*[25]

In the ancient Celtic world, the yew tree (**eburos*) had extraordinary importance; a passage by Caesar narrates that Catuvolcus, chief of the Eburones poisoned himself with yew rather than submit to Rome (*Gallic Wars* 6: 31). Similarly, Florus notes that when the Cantabrians were under siege by the legate Gaius Furnius in 22 BC, most of them took their lives either by the sword, by fire, or by a poison extracted *ex arboribus taxeis*, that is, from the yew tree (2: 33, 50–51). In a similar way, Orosius notes that when the Astures were besieged at *Mons Medullius*, they preferred to die by their own swords or by the yew tree poison rather than surrender (6, 21, 1).

59.7.1 Religion

The yew is often found in churchyards in England, Wales, Scotland, Ireland, France and northern areas of Spain. In France, the oldest yew trees are almost all located in church yards of Normandy and a chapel was very often laid out in the hollow trunk. Some examples can be found in La Haye-de-Routot or La Lande-Patry. It is said that up to 40 people could stand inside one of the La-Haye-de-Routot yew trees and the Le Ménil-Ciboult yew is probably the largest one (13 m diameter*[26]). Indeed some of these trees are exceptionally large (over 5 m diameter) and may be over 2,000 years old. Sometimes monks planted yews in the middle of their cloister, as at Muckross Abbey (Ireland) or abbaye de Jumièges (France). Some ancient yew trees are located at St Mary the Virgin Church, Overton-on-Dee in Wales.

In Asturian tradition and culture the yew tree has had a real link with the land, the people, the ancestors and the ancient religion. It was tradition on All Saints Day to bring a branch of a yew tree to the tombs of those who had died recently so they will find the guide in their return to the Land of Shadows. The yew tree has been found near chapels, churches and cemeteries since ancient times as a symbol of the transcendence of death, and is usually found in the main squares of the villages where people celebrated the open councils that served as a way of general assembly to

Foliage of Irish yew, Taxus baccata fastigiata*; note the leaves spreading all round the erect shoots*

rule the village affairs.

It has been suggested that the Sacred Tree at the Temple at Uppsala was an ancient yew tree.*[27]*[28] The Christian church commonly found it expedient to take over existing pre-Christian sacred sites for churches. It has also been suggested that yews were planted at religious sites as their long life was suggestive of eternity, or because being toxic they were seen as trees of death.*[29] Another suggested explanation is that yews were planted to discourage farmers and drovers from letting animals wander onto the burial grounds, the poisonous foliage being the disincentive. A further possible reason is that fronds and branches of yew were often used as a substitute for palms on Palm Sunday.*[29]*[30]*[31]

In traditional Germanic paganism, Yggdrasill was often seen as a giant ash tree. Many scholars now agree that in the past an error has been made in the interpretation of the ancient writings, and that the tree is most likely a European yew (Taxus baccata). This mistake would find its origin in an alternative word for the yew tree in the Old Norse, namely Needle Ash (barraskr). In addition, ancient sources, including the Eddas, speak about a *vetgrønster vida* which means "evergreen tree". An ash sheds its leaves in the winter, while yew trees retain their needles.

Conifers were in the past often seen as sacred, because they never lose their green. In addition, the tree of life was not only an object from the stories, but also believers often gathered around an existing tree. The yew releases gaseous toxins (taxine) on hot days. Taxine is in some instances capable of causing hallucinations. This has some similarities with the story that Odin had a revelation (the wisdom of the runes) after having been hanging from the tree for nine

Door of the Chapel in a Norman yew

days.

59.7.2 Medicines

In 1021, Avicenna introduced the medicinal use of *T. baccata* for phytotherapy in *The Canon of Medicine*. He named this herbal drug "Zarnab" and used it as a cardiac remedy. This was the first known use of a calcium channel blocker

drug, which were not in wide use in the Western world until the 1960s.*[32]

Certain compounds found in the bark of yew trees were discovered by Wall and Wani in 1967 to have efficacy as anti-cancer agents. The precursors of the chemotherapy drug paclitaxel (taxol) can be synthesized easily from the extracts of the leaves of European yew,*[33] which is a more renewable source than the bark of the Pacific yew (*Taxus brevifolia*). This ended a point of conflict in the early 1990s; many environmentalists, including Al Gore, had opposed the harvesting of yew for paclitaxel cancer treatments. Docetaxel can then be obtained by semi-synthetic conversion from the precursors.

In the Central Himalayas, the plant is used as a treatment for breast and ovarian cancer.*[34]

59.7.3 Woodworking and longbows

Bole of an ancient yew in Pont-de-Buis-lès-Quimerch, Brittany

Wood from the yew is classified as a closed-pore softwood, similar to cedar and pine. Easy to work, yew is among the hardest of the softwoods; yet it possesses a remarkable elasticity, making it ideal for products that require springiness, such as bows.*[35]

Yew is also associated with Wales and England because of the longbow, an early weapon of war developed in northern Europe, and as the English longbow the basis for a medieval tactical system. The oldest surviving yew longbow was found at Rotten Bottom in Dumfries and Galloway, Scotland. It has been given a calibrated radiocarbon date of 4040 BC to 3640 BC and is on display in the National Museum of Scotland. Yew is the wood of choice for longbow making; the heartwood is always on the inside of the bow with the sapwood on the outside. This makes most efficient use of their properties as heartwood is best in compression whilst sapwood is superior in tension. However, much yew is knotty and twisted, and therefore unsuitable for bowmaking; most trunks do not give good staves and even in a good trunk much wood has to be discarded.

The trade of yew wood to England for longbows was so robust that it depleted the stocks of good-quality, mature yew over a vast area. The first documented import of yew bowstaves to England was in 1294. In 1350 there was a serious shortage, and Henry IV of England ordered his royal bowyer to enter private land and cut yew and other woods. In 1423 the Polish king commanded protection of yews in order to cut exports, facing nearly complete

destruction of local yew stock.*[36] In 1470 compulsory archery practice was renewed, and hazel, ash, and laburnum were specifically allowed for practice bows. Supplies still proved insufficient, until by the Statute of Westminster in 1472, every ship coming to an English port had to bring four bowstaves for every tun.*[37] Richard III of England increased this to ten for every tun. This stimulated a vast network of extraction and supply, which formed part of royal monopolies in southern Germany and Austria. In 1483, the price of bowstaves rose from two to eight pounds per hundred, and in 1510 the Venetians would only sell a hundred for sixteen pounds. In 1507 the Holy Roman Emperor asked the Duke of Bavaria to stop cutting yew, but the trade was profitable, and in 1532 the royal monopoly was granted for the usual quantity "if there are that many." In 1562, the Bavarian government sent a long plea to the Holy Roman Emperor asking him to stop the cutting of yew, and outlining the damage done to the forests by its selective extraction, which broke the canopy and allowed wind to destroy neighbouring trees. In 1568, despite a request from Saxony, no royal monopoly was granted because there was no yew to cut, and the next year Bavaria and Austria similarly failed to produce enough yew to justify a royal monopoly. Forestry records in this area in the 17th century do not mention yew, and it seems that no mature trees were to be had. The English tried to obtain supplies from the Baltic, but at this period bows were being replaced by guns in any case.*[38]

59.7.4 Horticulture

*An Irish yew (*Taxus baccata *'Fastigiata') planted at Kenilworth Castle*

Today European yew is widely used in landscaping and ornamental horticulture. Due to its dense, dark green, mature

foliage, and its tolerance of even very severe pruning, it is used especially for formal hedges and topiary. Its relatively slow growth rate means that in such situations it needs to be clipped only once per year (in late summer).

Well over 200 cultivars of *T. baccata* have been named. The most popular of these are the Irish yew (*T. baccata* 'Fastigiata'), a fastigiate cultivar of the European yew selected from two trees found growing in Ireland, and the several cultivars with yellow leaves, collectively known as "golden yew".*[4]*[7] In some locations, e.g. when hemmed in by buildings or other trees, an Irish yew can reach 20 feet in height without exceeding 2 feet in diameter at its thickest point, although with age many Irish yews assume a fat cigar shape rather than being truly columnar.

The following cultivars have gained the Royal Horticultural Society's Award of Garden Merit:-

European yew will tolerate growing in a wide range of soils and situations, including shallow chalk soils and shade,*[46] although in deep shade its foliage may be less dense. However it cannot tolerate waterlogging, and in poorly-draining situations is liable to succumb to the root-rotting pathogen *Phytophthora cinnamomi*.

In Europe, *Taxus baccata* grows naturally north to Molde in southern Norway, but it is used in gardens further north. It is also popular as a bonsai in many parts of Europe and makes a handsome small to large sized bonsai.*[47]

59.7.5 Musical instruments

The late Robert Lundberg, a noted luthier who performed extensive research on historical lute-making methodology, states in his 2002 book *Historical Lute Construction* that yew was historically a prized wood for lute construction. European legislation establishing use limits and requirements for yew limited supplies available to luthiers, but it was apparently as prized among medieval, renaissance, and baroque lute builders as Brazilian Rosewood is among contemporary guitar-makers for its quality of sound and beauty.

59.8 Conservation

Clippings from ancient specimens in the UK, including the Fortingall Yew, were taken to the Royal Botanic Gardens in Edinburgh to form a mile-long hedge. The purpose of this "Yew Conservation Hedge Project" is to maintain the DNA of *Taxus baccata*. The species is threatened by felling, partly due to rising demand from pharmaceutical companies, and disease.*[48]

59.9 See also

- List of plants poisonous to equines

59.10 Notes

[1] Rushforth, K. (1999). *Trees of Britain and Europe*. Collins ISBN 0-00-220013-9.

[2] Douglas Simms. "A Celto-Germanic Etymology for Flora and Fauna which will Boar Yew". Retrieved 10 July 2008.

[3] Theophrastus, *Enquiry into Plants*, iii.10.2; iv.1.3, etc.

[4] Mitchell, A. F. (1972). *Conifers in the British Isles*. Forestry Commission Booklet 33.

[5] "The Hawfinch". Wbrc.org.uk. Retrieved 2010-07-22.

[6] Snow, David; Snow, Barbara (2010). *Birds and Berries*. London: A & C Black. pp. 29–30. ISBN 9781408138229.

[7] Dallimore, W., & Jackson, A. B. (1966). *A Handbook of Coniferae and Ginkgoaceae* 4th ed. Arnold.

[8] Mayer, Hannes (1992). *Waldbau auf soziologisch-ökologischer Grundlage* [*Silviculture on socio-ecological basis*] (in German) (4th ed.). Fischer. p. 97. ISBN 3-437-30684-7.

[9] Bevan-Jones, Robert (2004). *The ancient yew: a history of* Taxus baccata. Bollington: Windgather Press. p. 28. ISBN 0-9545575-3-0.

[10] Lewington, A., & Parker, E. (1999). *Ancient Trees: Trees that Live for a Thousand Years*. London: Collins & Brown Ltd. ISBN 1-85585-704-9

[11] Harte, J. (1996). How old is that old yew? *At the Edge* 4: 1–9. Available online.

[12] Kinmonth, F. (2006). Ageing the yew – no core, no curve? *International Dendrology Society Yearbook* 2005: 41–46.

[13] Bevan-Jones, Robert (2004). *The ancient yew: a history of* Taxus baccata. Bollington: Windgather Press. p. 38. ISBN 0-9545575-3-0.

[14] Bevan-Jones, Robert (2004). *The ancient yew: a history of* Taxus baccata. Bollington: Windgather Press. p. 49. ISBN 0-9545575-3-0.

[15] "Monumentos Naturales" (in Spanish). Gobierno del Principado de Asturias. Retrieved 14 March 2013. Contains Word document "Monumento Natural Teixu de Bermiego".

[16] Ogren, Thomas (2015). *The Allergy-Fighting Garden*. Berkeley, CA: Ten Speed Press. p. 205. ISBN 9781607744917.

[17] "Yew poisoning". US National Library of Medicine. Retrieved 2015-04-05.

[18] "Yew". Provet. Retrieved 23 March 2013.

[19] Thomas, Peter A.; Packham, John R. (2007). *Ecology of Woodlands and Forests: Description, Dynamics and Diversity*. Cambridge [u.a.]: Cambridge Univ. Press. pp. 226–227. ISBN 0521542316.

[20] "How poisonous is the yew?". Ancient-yew.org. Retrieved 2010-07-22.

[21] Tiwary, A. K.; Puschner, B.; Kinde, H.; Tor, E. R. (2005). "Diagnosis of *Taxus* (Yew) poisoning in a horse" (PDF). *Journal of Veterinary Diagnostic Investigation* **17** (3): 252–255. doi:10.1177/104063870501700307. PMID 15945382.

[22] http://toxnet.nlm.nih.gov/cgi-bin/sis/search/a?dbs+hsdb:@term+@DOCNO+3541 http://toxnet.nlm.nih.gov/cgi-bin/sis/search/a?dbs+hsdb:@term+@DOCNO+3541 TAXINE - National Library of Medicine HSDB Database, section "Animal Toxicity Studies"

[23] "Taxus baccata, yew - THE POISON GARDEN website". Thepoisongarden.co.uk. Retrieved 2010-07-22.

[24] "THE CLACTON SPEAR TIP".

[25] White, T.S.; Boreham, S.; Bridgland, D. R.; Gdaniec, K.; White, M. J. (2008). "The Lower and Middle Palaeolithic of Cambridgeshire" (PDF). English Heritage Project. Retrieved 23 March 2013.

[26] List of world largest trees

[27] Ohlmarks, Å. (1994). *Fornnordiskt lexikon*. p 372.

[28] Hellquist, O. (1922). *Svensk etymologisk ordbok*. p 266

[29] Andrews, W.(ed.)(1897)*Antiquities and Curiosities of the Church, William Andrews & Co., London 1897; pp. 256-278: 'Amongst the ancients the yew, like the cypress, was regarded as the emblem of death... As, to the early Christian, death was the harbinger of life; he could not agree with his classic forefathers in employing the yew or the cyprus, "as an emblem of their dying for ever." It was the very antithesis of this, and as an emblem of immortality, and to show his belief in the life beyond the grave, that led to his cultivation of the yew in all the burying grounds of those who died in the new faith, and this must be regarded as the primary idea of its presence there... Evelyn's opinion is more decisive: —"that we find it so universally planted in our churchyards, was doubtless, from its being thought a symbol of immortality, the tree being so lasting and always green.'"*

[30] "Palm Sunday: All About Palm Sunday of the Lord's Passion". Churchyear.net. Retrieved 2010-07-22.

[31] Dún Laoghaire Parks Some yew trees were actually there before the church was built...King Edward 1st ordered yew trees to be planted in churchyards to offer some protection to the buildings... Yews are poisonous so by planting them in the churchyards cattle that were not allowed to graze on hallowed ground were safe from eating yew. Yew was the traditional wood used for making long bows – planting in churchyards ensured availability in times of need. Yew branches on touching the ground take root and sprout again – this became the symbol of death, rebirth and therefore immortality.

[32] Tekol, Y. (2007). "The medieval physician Avicenna used an herbal calcium channel blocker, *Taxus baccata* L.". *Phytotherapy Research* **21** (7): 701–702. doi:10.1002/ptr.2173. PMID 17533639.

[33] National Non-Food Crops Centre, "Yew". Retrieved on 2009-04-23.

[34] *Asia Medicinal Plants Database*

[35] http://www.wood-database.com/lumber-identification/softwoods/european-yew/ The Wood Database: European Yew

[36] Romuald Sztyk. Obrót nieruchomościami w świetle prawa o ochronie środowiska. „Rejent - Miesięcznik Notariatu Polskiego”. 10 (150), October 2003

[37] *"...because that our sovereign lord the King, by a petition delivered to him in the said parliament, by the commons of the same, hath perceived That the great scarcity of bowstaves is now in this realm, and the bowstaves that be in this realm be sold as an excessive price..."*, Statutes at Large

[38] *Yew: A History*. Hageneder F. Sutton Publishing, 2007. ISBN 978-0-7509-4597-4.

[39] "RHS Plant Selector - *Taxus baccata*". Retrieved 5 June 2013.

[40] "RHS Plant Selector - *Taxus baccata* 'Fastigiata'". Retrieved 5 June 2013.

[41] "RHS Plant Selector - *Taxus baccata* 'Fastigiata Aureomarginata'". Retrieved 5 June 2013.

[42] "RHS Plant Selector - *Taxus baccata* 'Repandens'". Retrieved 5 June 2013.

[43] "RHS Plant Selector - *Taxus baccata* 'Repens Aurea'". Retrieved 5 June 2013.

[44] "RHS Plant Selector - *Taxus baccata* 'Semperaurea'". Retrieved 5 June 2013.

[45] "RHS Plant Selector - *Taxus baccata* 'Standishii'". Retrieved 5 June 2013.

[46] Hillier Nurseries, "The Hillier Manual Of Trees And Shrubs", David & Charles, 1998, p863

[47] D'Cruz, Mark. "Ma-Ke Bonsai Care Guide for Taxus baccata". Ma-Ke Bonsai. Retrieved 2011-11-19.

[48] "Ancient yew DNA preserved in hedge project". United Press International. 7 November 2008. Retrieved 27 September 2013.

59.11 References

- Chetan, A. and Brueton, D. (1994) *The Sacred Yew*, London: Arkana, ISBN 0-14-019476-2
- Conifer Specialist Group (1998) *Taxus baccata*, In: IUCN 2006/UCN Red List of Threatened Species, WWW page (Accessed 3 February 2007)
- Hartzell, H. (1991) *The yew tree: a thousand whispers: biography of a species*, Eugene: Hulogosi, ISBN 0-938493-14-0
- Simón, F. M. (2005) Religion and Religious Practices of the Ancient Celts of the Iberian Peninsula, *e-Keltoi*, v. 6, p. 287-345, ISSN 1540-4889 online

59.12 External links

- Notes on the Yew Druid Network
- www.collect-if.net In France Switzerland and Belgium are yew leaves collected for pharmaceutical use.
- Images and location details of ancient yews
- *Taxus baccata* at the Encyclopedia of Life

Chapter 60

Shrub

For other uses, see Shrub (disambiguation).

A **shrub** is a small to medium-sized woody plant. It is distinguished from a tree by its multiple stems and shorter

A broom shrub in flower.

height, usually under 6 m (20 ft) tall. Plants of many species may grow either into shrubs or trees, depending on their growing conditions. Small, low shrubs, generally less than 2 m (6.6 ft) tall, such as lavender, periwinkle and most small garden varieties of roses, are often termed **subshrubs** or **bushes**.

An area of cultivated shrubs in a park or a garden is known as a shrubbery. When clipped as topiary, suitable species or varieties of shrubs develop dense foliage and many small leafy branches growing close together. Many shrubs respond well to renewal pruning, in which hard cutting back to a "stool" results in long new stems known as "canes". Other shrubs respond better to selective pruning to reveal their structure and character.

Shrubs in common garden practice are generally considered broad-leaved plants, though some smaller conifers such as mountain pine and common juniper are also shrubby in structure. Species that grow into a shrubby habit may be

A rhododendron shrubbery in Sheringham Park.

either deciduous or evergreen.

60.1 Shrubs as a botanical structural form

Main article: shrubland

In botany and ecology, a shrub is more specifically used to describe the particular physical structural or plant life-form of woody plants which are less than 8 metres (26 ft) high and usually have many stems arising at or near the base.

For example, a descriptive system widely adopted in Australia is based on structural characteristics based on life-form, plus the height and amount of foliage cover of the tallest layer or dominant species.*[1]

For shrubs 2–8 metres (6.6–26.2 ft) high the following structural forms are categorized:

- dense foliage cover (70–100%) —**closed-scrub**
- mid-dense foliage cover (30–70%) —**open-scrub**
- sparse foliage cover (10–30%) —**tall shrubland**
- very sparse foliage cover (<10%) —**tall open shrubland**

For shrubs less than 2 metres (6.6 ft) high the following structural forms are categorized:

- dense foliage cover (70–100%) —**closed-heath** or **closed low shrubland**—(*North America*)
- mid-dense foliage cover (30–70%) —**open-heath** or **mid-dense low shrubland**—(*North America*)
- sparse foliage cover (10–30%) —**low shrubland**
- very sparse foliage cover (<10%) —**low open shrubland**

60.2 List of shrubs (bushes)

Those marked with * can also develop into tree form.

60.3 See also

- Shrubbery
- Shrubland

60.4 References

[1] Costermans, L. F. (1993) *Native trees and shrubs of South-Eastern Australia*. rev. ed. ISBN 0-947116-76-1

Chapter 61

Rhamnus frangula

Rhamnus frangula (synonym ***Frangula alnus***), the **alder buckthorn**, is a tall deciduous shrub in the family Rhamnaceae. It is native to Europe, northernmost Africa, and western Asia, from Ireland and Great Britain north to 68°N in Scandinavia, east to central Siberia and Xinjiang in western China, and south to northern Morocco, Turkey, and the Alborz and Caucasus Mountains; in the northwest of its range (Ireland, Scotland), it is rare and scattered. It is also introduced and naturalised in eastern North America.*[3]*[4]*[5]*[6]*[7]

61.1 Taxonomy and naming

Alder Buckthorn was first formally described by Linnaeus in 1753 as *Rhamnus frangula*. It was subsequently separated by Philip Miller in 1768 into the genus *Frangula* on the basis of its hermaphrodite flowers with a five-parted corolla (dioecious, and four-parted in *Rhamnus*); this restored the treatment of pre-Linnaean authors, notably Tournefort.*[8] Although much disputed historically, the separation of *Frangula* from *Rhamnus* is now widely accepted, being supported by recent genetic data*[9] though a few authorities still retain the genus within *Rhamnus* (e.g. the *Flora of China*[7]).

The genus name *Frangula* refers to the brittle wood. Both the English and scientific species names refer to its commonly growing together with alders (*Alnus*) on damp sites. Unlike other "buckthorns", Alder Buckthorn does not have thorns.*[10]*[11] Other recorded names include glossy buckthorn and breaking buckthorn; historically, it was sometimes called "dogwood" through confusion of the leaves with those of Dogwood *Cornus sanguinea*.*[10]

61.2 Description

Alder Buckthorn is a deciduous shrub, growing to 3–6 m, occasionally to 7 m tall. It is usually multistemmed, but rarely forms a small tree with a trunk diameter of up to 20 cm. The bark is dark blackish-brown, with bright lemon-yellow inner bark exposed if cut. The shoots are dark brown, the winter buds without bud scales, protected only by the densely hairy outer leaves The leaves are ovate, 3–7 (–11) cm long by 2.5–4 (–6) cm wide, slightly downy on the veins, with an entire margin, 6–10 pairs of prominently grooved veins, and an 8–15 mm petiole; they are arranged alternately on the stems. The flowers are small, 3–5 mm diameter, star-shaped with five greenish-white acute triangular petals, hermaphroditic, and insect pollinated, flowering in May to June in clusters of two to ten in the leaf axils. The fruit is a small black berry 6–10 mm diameter, ripening from green through red in late summer to dark purple or black in early autumn, containing two or three pale brown 5 mm seeds. The seeds are primarily dispersed by frugivorous birds, which readily eat the fruit.*[3]*[5]*[6]*[11]*[7]*[12]

61.3 Ecology

Alder Buckthorn grows in wet soils in open woods, scrub, hedgerows and bogs, thriving well in sunlight and moderate shade, but less vigorously in dense shade; it prefers acidic soils though will also grow on neutral soils.*[6]*[10]*[12]

Flowering shoot

Rhamnus frangula is one of just two food plants (the other being *Rhamnus cathartica*) used by the Common Brimstone butterfly *Gonepteryx rhamni*. The flowers are valuable for bees, and the fruit an important food source for birds, particularly thrushes.*[11]

61.3.1 Invasive species

Rhamnus frangula was probably introduced to North America about 200 years ago, and in Canada about 100 years ago. It was planted for hedgerows, forestry plantings, and wildlife habitat, but has become an invasive species, invading forests in the northeastern United States and wetlands and moist forest in the Midwestern United States.*[13]*[14]*[15] It is predicted to continue to expand its North American range with time.*[13] Its invasiveness is assisted by its high adaptability and pollution tolerance.*[16]

It invades forests and grows in the understory in spots with a lot of light. These areas, usually where a tree has fallen, normally allow locally native tree seedlings to grow and eventually fill in the gap in the canopy. But when *F. alnus* invades and grows in these locations, its dense canopy prevents light from reaching the ground and therefore prevents other seedlings from growing.*[16] It tends to grow more densely and with larger individuals in lower topographical areas with moist, fertile soils, and is very problematic for land managers. Uplands forests are not invaded as easily as lower lying ones. Hemlock-oak stands, which tend to be older stands of trees, are much less suitable for *F. alnus* because the density of the tree canopy creates a more shady environment that is not as suitable for *F. alnus*. Eastern White Pine stands are easily invaded because they allow more light to reach the forest floor, and tree stands that are cut are very quickly invaded while undisturbed stands are rarely invaded.*[17]

Winter shoot with buds

Control

Small saplings can be hand-pulled, but control of larger examples is best achieved using herbicides.*[18] *F. alnus* and the related species *Rhamnus cathartica* have been banned from sale, transport, or import to Minnesota*[19] and Illinois.*[20] It is considered invasive, but not banned, in Connecticut.*[21]

61.4 Uses

61.4.1 Decorative

Rhamnus frangula *'Aslenifolia' with autumn colours*

Alder Buckthorn has limited decorative qualities without conspicuous flowers or bold foliage, and is mainly grown for its conservation value, particularly to attract Brimstone butterflies. A variegated cultivar *Rhamnus frangula* 'Variegata' and a cultivar with very slender leaves 'Aslenifolia' are sometimes grown in gardens as ornamental shrubs. The cultivar 'Tallhedge' has been selected for hedging.*[22]

61.4.2 Medicinal

Galen, a Greek physician of the 2nd century A.D., knew of Alder Buckthorn, although he did not distinguish clearly in his writings between it and other closely related species. All of these plants though, were credited with the power to protect against witchcraft, demons, poisons, and headaches.

The bark (and to a lesser extent the fruit) has been used as a laxative, due to its 3 - 7% anthraquinone content. Bark for medicinal use is dried and stored for a year before use, as fresh bark is violently purgative; even dried bark can be dangerous if taken in excess.*[3]*[22]

61.4.3 Charcoal

Alder Buckthorn charcoal is prized in the manufacture of gunpowder, being regarded as the best wood for the purpose. It is particularly highly valued for time fuses because of its very even burn rate.*[3]*[10] The wood was formerly used

for shoe lasts, nails, and veneer. The bark yields a yellow dye, and the unripe berries furnish a green dye.*[22]

61.5 References

[1] "The International Plant Names Index". Retrieved 3 March 2013. |chapter= ignored (help)

[2] "The Plant List: A Working list of All Plant Species".

[3] Rushforth, K. (1999). *Trees of Britain and Europe*. Collins ISBN 0-00-220013-9.

[4] Flora Europaea: *Frangula alnus*

[5] Den virtuella floran: *Frangula alnus* (in Swedish, with detailed maps)

[6] Stace, C., et al. Interactive Flora of NW Europe: *Frangula alnus*

[7] Flora of China: *Rhamnus frangula*

[8] Miller, P. (1754). *The Gardener's Dictionary*, 8th ed. Facsimile at Botanicus.org

[9] Bolmgren, K., & Oxelman, B. 2004. Generic limits in Rhamnus L. s.l. (Rhamnaceae) inferred from nuclear and chloroplast DNA sequence phylogenies. *Taxon* 53: 383–390.

[10] Vedel, H., & Lange, J. (1960). *Trees and Bushes in Wood and Hedgerow*. Methuen & Co Ltd.

[11] Natural England: Alder buckthorn

[12] Blamey, M. & Grey-Wilson, C. (1989). *Flora of Britain and Northern Europe*. ISBN 0-340-40170-2.

[13] Wingard, Hanna S. "Invasion of transition hardwood forests by exotic Rhamnus frangula: Chronology and site requirements". University of New Hampshire, 2007.

[14] "Common Buckthorn and Glossy Buckthorn". University of Maine Cooperative Extension Bulletin #2505.

[15] "glossy buckthorn". Invasive.org: Center for Invasive Species and Ecosystem Health.

[16] "Guide to invasive upland plant species in New Hampshire". New Hampshire Department of Agriculture, Markets & Food Terrestrial Invasive Plant Species, page 14.

[17] Chelsea Cunard and Thomas D. Lee. "Is patience a virtue? Succession, light, and the death of invasive glossy buckthorn (*Frangula alnus*)". Biological Invasions:Volume 11, Number 3 / March, 2009.

[18] "What you can do to control buckthorn!". MN Department of Natural Resources.

[19] "Buckthorn". MN Department of Natural Resources.

[20] "Reminder to Gardeners: Some Exotic Plants Banned in Illinois". Illinois DIllinois Department of Natural Resources. April 22, 2004.

[21] "Connecticut Invasive Plant List July 2009". CT Invasive Plants Council.

[22] Plants for a Future: *Rhamnus frangula*

Chapter 62

Rhamnus cathartica

Fruit

Rhamnus cathartica (**buckthorn**, **common buckthorn** or **purging buckthorn**) is a species in the family Rhamnaceae, native to Europe, northwest Africa and western Asia, from the central British Isles south to Morocco, and east to Kyrgyzstan.[*][2][*][3] It was introduced to North America as an ornamental shrub in the early 19th century or perhaps before.[*][4][*][5]

62.1 Description

Rhamnus cathartica is a deciduous shrub or small tree growing up to 10 metres (33 ft) tall, with grey-brown bark and spiny branches. The leaves are elliptic to oval, 25–90 millimetres (1–4 in) long and 12–35 mm (0.5–1 in) broad; they are green, turning yellow in autumn, and are arranged somewhat variably in opposite to subopposite pairs or alternately. The flowers are yellowish-green, with four petals; they are dioecious and insect pollinated. The fruit is

a globose black drupe, 6–10 mm (0.2–0.4 in) diameter and containing two to four seeds; it is mildly poisonous for people, but readily eaten by birds, which disperse the seeds in their droppings.*[6]*[7]

The species was originally named by Carl Linnaeus as *Rhamnus catharticus*, but this spelling was corrected to *cathartica* as the genus name *Rhamnus* is treated as being of feminine gender.*[8]

62.2 Toxicity

The seeds and leaves are considered toxic to humans and animals, causing stomach cramps and laxative effects thought to serve a function in seed dispersal. The chemical compounds responsible for this laxative effect are anthraquinone*[9] and emodin.

In 1994, *R. cathartica* was implicated in the outbreak of an idiopathic neurological disease in horses, although no causative agent was officially identified. In trials where rodents were fed the leaves and stems of *R. cathartica*, glycogen metabolism became abnormal and glycogen deposits formed in the cytoplasm of liver cells. Abnormalities in glycogen metabolism lead to diabetes in humans.*[10]

62.3 Ecology

Rhamnus cathartica is shade-tolerant, moderately fast-growing and short-lived. It is a food plant of the brimstone butterfly, *Gonepteryx rhamni*. The sulphur-yellow males are indicative of the plant's presence.

This species is the alternate host for the important rust disease of cereals caused by *Puccinia coronata*. *Rhamnus cathartica* is also the primary overwintering host in North America for an important agricultural pest of soybeans, the soybean aphid.*[11]

62.3.1 Allelopathy

Secondary compounds, particularly emodin, have been found in the fruit, leaves, and bark of the plant, and may protect it from insects, herbivores and pathogens.*[12] The emodin present in *R. cathartica* fruit may prevent early consumption, as it is found most in unripe fruits, which allows seeds to reach maturity before being dispersed. Birds and mice significantly avoid eating unripe fruits, and if forced to ingest emodin or unripe fruit, the animals regurgitate the meal or produce loose, watery stools.*[12]

Allelopathic effects of exudates from *R. cathartica* leaf litter, roots, bark, leaves and fruit may reduce germination of other plant species in the soil. Soils in buckthorn-dominated areas are higher in nitrogen and carbon than normal soils, which speeds up decomposition rates of leaf litter.*[13] This can result in bare patches of soil being formed and *R. cathartica* performs well in such disturbed habitats, so this may be adaptive for the setting of its seed.*[12]

62.3.2 Invasive species

In North America

The species is naturalised and invasive in parts of North America.*[3]*[14]*[12] *Rhamnus cathartica* has a competitive advantage over native trees and shrubs in North America because it leafs out before native species.*[15] Of the annual carbon gain in *R. cathartica*, 27-35% comes from photosynthesis occurring before the leaves of other plants emerge.*[9] Soil in woodlands dominated by *R. cathartica* was higher in nitrogen, pH and water content than soil in woodlands relatively free of *R. cathartica*,*[16]*[13] probably because *R. cathartica* has high levels of nitrogen in its leaves and these leaves decompose rapidly.

Rhamnus cathartica is also associated with invasive European earthworms (*Lumbricus* spp.) in the northern Midwest of North America.*[17] Removing *R. cathartica* led to a decrease of around 50% in the biomass of invasive earthworms.*[18]

A cutting board made from common buckthorn and Norway maple.

62.4 Uses

The bark and fruit of *Rhamnus catharticus* were used as a purgative in the past, although their potentially dangerous violent action and side-effects means they are now rarely used.*[19] The wood is hard and dense, but little-used.

62.5 Control methods

Rhamnus catharticus is difficult to control in its invasive range, because it sprouts vigorously and repeatedly from the root collar following cutting, girdling or burning.*[20] Herbicide application to newly cut stumps is a popular and effective control method, but seeds stay viable in the soil for several years before sprouting, so repeated treatments and long-term monitoring of infested areas is required.*[21] Garlon and Tordon and their derivatives have been found to be effective chemical means of control. Roundup can be used but is less reliable.*[9] An application of these chemicals in early winter reduces the risk of negatively affecting non-target species, as most have gone dormant by this time. It is also easier to spot infestations at this time of the year, as the leaves of *R. catharticus* stay out an average of 58 days longer than native plants.*[9]

Mechanical control methods such as pulling and chopping of plants are more environmentally friendly, but also very time-consuming. Plants with stems less than half an inch in diameter or less than a metre tall can easily be pulled, but pulling risks disturbing the roots of adjacent, native plants and harming them as well.*[21] Propane weed-torches may also be used to kill seedlings, which will generally not resprout if burned in spring or early summer.*[9]

62.6 References

[1] "The Plant List: A Working List of All Plant Species".

[2] Flora Europaea: *Rhamnus cathartica*

[3] Germplasm Resources Information Network: *Rhamnus cathartica*

[4] Torrey, J. (1824) A flora of the northern and middle sections of the United States: or, a systematic arrangement of all the plants hitherto discovered in the United States north of Virginia. vol 1. T. and J. Swords, New York, pp. 513

[5] Possessky, S. L., Williams, C. E., Moriarty, W. J. (2000). "Glossy Buckthorn, *Rhamnus frangula* L.: a threat to riparian plant communities of the northern allegheny plateau (USA)". *Natural Areas Journal* **20**: 290–292.

[6] Rushforth, K. (1999). *Trees of Britain and Europe*. Collins ISBN 0-00-220013-9.

[7] Flora of NW Europe: *Rhamnus cathartica*

[8] Bean, W. J. (1980). *Trees and Shrubs Hardy in the British Isles* 8th ed., vol. 3. John Murray ISBN 0-7195-2427-X.

[9] Gale, Samuel (2000). "Control of the invasive exotic *Rhamnus cathartica* in temperate North American forests". *Restoration and Reclamation Review* **6**: 1–13.

[10] Lichtensteiger, C; Johnston, N.; Beasley, V. (1997). "*Rhamnus cathartica* (buckthorn) hepatocellular toxicity in mice". *Toxicologic Pathology* **25**: 449–452. doi:10.1177/019262339702500503.

[11] Ragsdale, D., Voegtlin, D., O'Neil, R. (2004). "Soybean aphid biology in North America". *Annals of the Entomological Society of America* **97**: 204–208. doi:10.1603/0013-8746(2004)097[0204:sabina]2.0.co;2.

[12] Kathleen S. Knight, Jessica S. Kurylo, Anton G. Endress, J. Ryan Stewart, Peter B. Reich (2007). "Ecology and ecosystem impacts of common buckthorn (*Rhamnus cathartica*): a review". *Biological Invasions* **9**: 925–937. doi:10.1007/s10530-007-9091-3.

[13] Liam Heneghan, Farrah Fatemi, Lauren Umek, Kevin Grady, Kristen Fagen, Margaret Workman (2006). "The invasive shrub European buckthorn (*Rhamnus cathartica*, L.) alters soil properties in Midwestern U.S. woodlands". *Applied Soil Ecology* **32**: 142–148. doi:10.1016/j.apsoil.2005.03.009.

[14] Minnesota Department of Natural Resources: *Buckthorn - Invasive Species*

[15] Barnes, W. J. (1972) The autecology of the *Lonicera* × *bella* complex. Dissertation, University of Wisconsin.

[16] Heneghan, L., Rauschenberg, C., Fatemi, F., Workman, M. (2004). "European buckthorn (*Rhamnus cathartica*) and its effect on some ecosystem properties in an urban woodland". *Ecological Restoration* **22** (4): 275–280. doi:10.3368/er.22.4.275.

[17] Heneghan, L., Steffen, J., Fagen, K. (2007). "Interactions of an introduced shrub and introduced earthworms in an Illinois urban woodland: impact on leaf litter decomposition". *Pedobiologia* **50**: 543–551. doi:10.1016/j.pedobi.2006.10.002.

[18] Michael D. Madritch and Richard L. Lindroth (2009). "Removal of invasive shrubs reduces exotic earthworm populations". *Biological Invasions* **11**: 663–671. doi:10.1007/s10530-008-9281-7.

[19] Plants for a Future: *Rhamnus cathartica*

[20] Barnes, Burton V. and Wagner Jr., Warren H. (2004) *Michigan Trees* ISBN 978-0-472-08921-5

[21] "Common Buckthorn Glossy Buckthorn". USDA Forest Service.

62.7 External links

- Biological and Control Information from the Invading Species Awareness Program Invading Species.com
- Information and Resources on Common Buckthorn in Ontario Most Unwanted - Common Buckthorn

Chapter 63

Sambucus nigra

Sambucus nigra is a species complex of flowering plants in the family Adoxaceae native to most of Europe.*[1] Common names include **elder**, **elderberry**, **black elder**, **European elder**, **European elderberry** and **European black elderberry**.*[2]*[3] It grows in a variety of conditions including both wet and dry fertile soils, primarily in sunny locations.

63.1 Description

Fruit cluster

It is a deciduous shrub or small tree growing to 6 m (20 ft) tall and wide*[4] (rarely 10m tall). The bark, light grey when young, changes to a coarse grey outer bark with lengthwise furrowing. The leaves are arranged in opposite pairs, 10–30 cm long, pinnate with five to seven (rarely nine) leaflets, the leaflets 5–12 cm long and 3–5 cm broad,

Flowers

with a serrated margin.

The hermaphrodite flowers are borne in large, flat corymbs 10–25 cm diameter in late spring to mid summer, the individual flowers ivory white, 5–6 mm diameter, with five petals; they are pollinated by flies.

The fruit is a glossy dark purple to black berry 3–5 mm diameter, produced in drooping clusters in late autumn;*[4] they are an important food for many fruit-eating birds, notably blackcaps.

63.1.1 Subspecies

See also: Sambucus

There are several other closely related species, native to Asia and North America, which are similar, and sometimes treated as subspecies of *Sambucus nigra*. The blue or Mexican elderberry, *Sambucus mexicana*, is now generally treated as one or two subspecies of *Sambucus nigra* subsp. *canadensis*[*][5] and *Sambucus nigra* subsp. *caerulea*.[*][6]

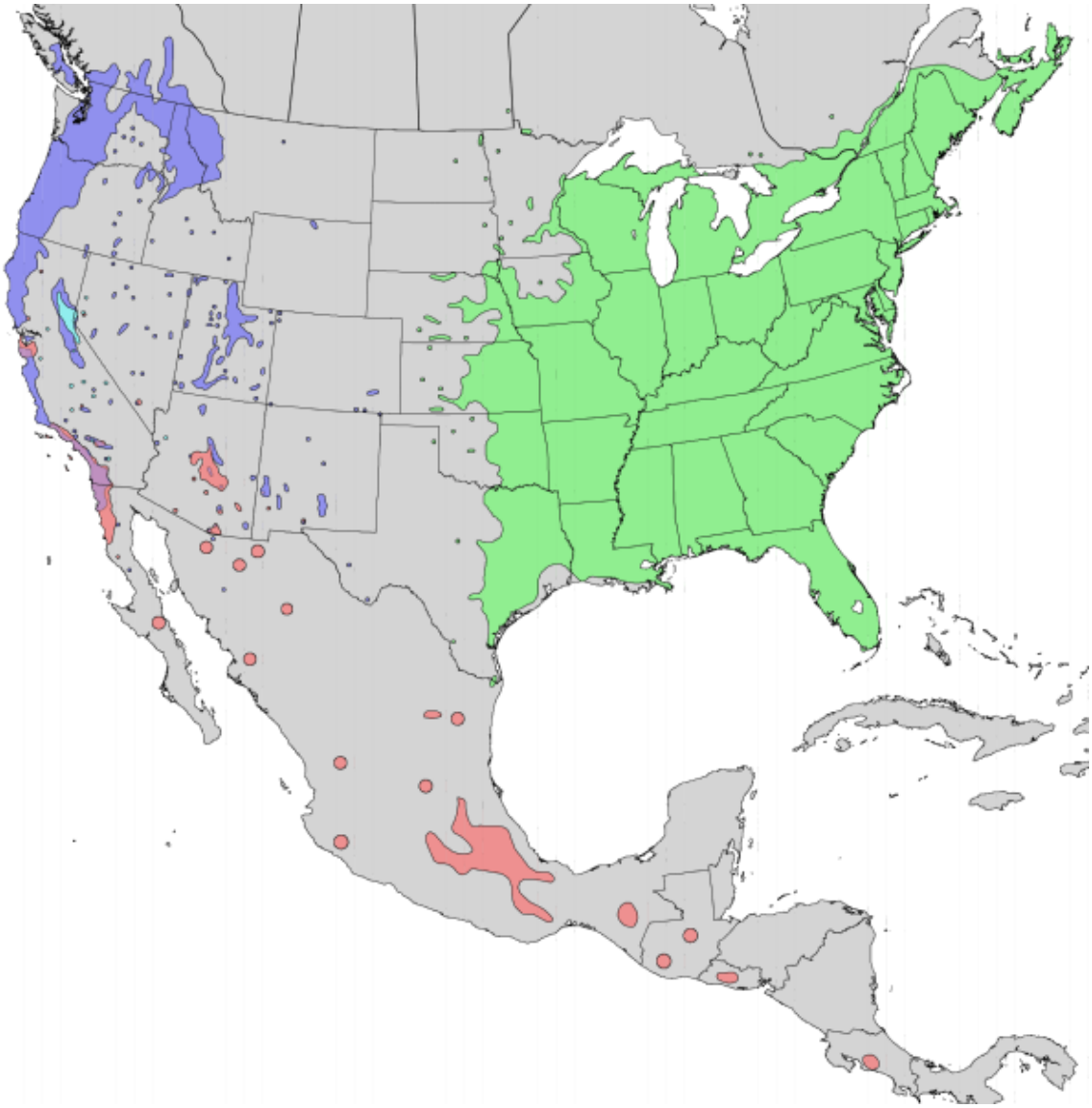
S. nigra is recorded as very common in Ireland in hedges as scrub in woods.[*][7][*][8]

63.2 Cultivation

Some selections and cultivars have variegated or coloured leaves and other distinctive qualities, and are grown as ornamental plants.

The following cultivars have gained the Royal Horticultural Society's Award of Garden Merit:-

- *S. nigra* 'Aurea' [*]*[9]*
- *S. nigra* 'Laciniata' [*]*[10]*
- *S. nigra* f. *porphyrophylla* 'Gerda' (syn. 'Black beauty')[*]*[11]*



Natural range of North American Sambucus nigra *subspecies.*

63.3 Culinary uses

The dark blue/purple berries can be eaten when fully ripe but are mildly poisonous in their unripe state.*[12] All green parts of the plant are poisonous, containing cyanogenic glycosides (Vedel & Lange 1960). The berries are edible after cooking and can be used to make jam, jelly, chutney and Pontack sauce.

The flowerheads are commonly used in infusions, giving a very common refreshing drink in Northern Europe and the Balkans. Commercially these are sold as Elderflower cordial.*[13] In Europe, the flowers are made into a syrup or cordial (in Romanian: Socată, in Swedish: fläder(blom)saft), which is diluted with water before drinking. The popularity of this traditional drink has recently encouraged some commercial soft drink producers to introduce elderflower-flavoured drinks (Fanta Shokata, Freaky Fläder). The flowers can also be dipped into a light batter and then fried to make elderflower fritters. In Scandinavia and Germany, soup made from the elder berry (e.g. the German *Fliederbeersuppe*) is a traditional meal.

Both flowers and berries can be made into elderberry wine, and in Hungary an elderberry brandy is made that requires 50 kg of fruit to produce 1 litre of brandy. In south-western Sweden, it is traditional to make a snaps liqueur flavoured with elderflower. Elderflowers are also used in liqueurs such as St. Germain, and in a mildly alcoholic sparkling elderflower 'champagne'.

In Beerse, Belgium, a variety of Jenever called *Beers Vlierke* is made from the berries.

Elderberry Jam

63.4 Medicinal

This plant is traditionally used as a medicinal plant by many native peoples and herbalists alike.*[14]*[15] Stembark, leaves, flowers, fruits, and root extracts are used to treat bronchitis, cough, upper respiratory cold infections, and fever.

In a placebo-controlled, double-blind study, black elderberry (*Sambucus nigra*) was shown to be effective for treating Influenza B.*[16] People using the elderberry extract recovered much faster than those only on a placebo. The study was published in the Journal of Alternative Complementary Medicine.

A small study published in 2004 showed that 93% of flu patients given extract were completely symptom-free within two days; those taking a placebo recovered in about six days. This current study shows that it works for type A flu, reports lead researcher Erling Thom, with the University of Oslo in Norway.*[17] Further study confirmed the beneficial effect of elderberry on Influenza.*[18]

Elderberry flowers are sold in Ukrainian and Russian drugstores for relief of congestion, specifically as an expectorant to relieve dry cough and make it productive. The dried flowers are simmered for 15 minutes, and the resulting flavorful and aromatic tea is poured through a coffee filter. Some individuals find it better hot, others cold, and some may experience an allergic reaction.

Sambucus nigra fruits and flowers have been used in traditional Austrian medicine - internally (fruits as tea, jelly, juice, or syrup; flowers as tea or syrup) for treatment of disorders of the respiratory tract, mouth, gastrointestinal tract, and skin, and for viral infections, fever, colds and flu.*[19]

The flowers can be used to make an herbal tea as a remedy for inflammation caused by colds and fever.*[20]

Some studies have been done on *Sambucus nigra* extract and its ability to act like insulin in treating diabetes due to its richness in anthocyanins, which also reduces oxidative stress.*[21]It increased glucose uptake by 70%, glucose oxidation by 50%, and glycogenesis by 70% on average. It is likely that the extract uses similar pathways that insulin does, but also stimulates insulin secretion. Similar findings of plant extracts that improve glucose uptake have been discovered in mushrooms, coriander, mistletoe, eucalyptus, lucerne, and agrimony.*[22]

The medicinal Jelly ear fungus is frequently found on elder trees.

Sambuci flos*: dried sambucus nigra flowers as used in herbal tea*

63.5 Diseases

Like other elderberries, *Sambucus nigra* is subject to elder whitewash fungus.

*Elder whitewash fungus (*Hyphodontia sambuci*).*

63.6 Wildlife value

Elder rates as fair to good forage for animals such as mule deer, elk, sheep and small birds. It is classified as nesting habitat for many birds, including hummingbirds, warblers, and vireos. Elderberries are a favorite food for migrating band-tailed pigeons in northern California, which may sometimes strip an entire bush in a short time.

It is also good cover for large and small mammals.*[23]

Elder is cited as a poisonous plant for mammals, and as a weed in certain habitats.*[24] All parts of the plant except for the flowers and ripe berries (but including the ripe seeds) are poisonous, containing the cyanogenic glycoside sambunigrin ($C_{14}H_{17}NO_6$, CAS number 99-19-4).*[25] The bark contains calcium oxalate crystals.

63.7 Other uses

The strong-smelling foliage was used in the past, tied to a horse's mane, to keep flies away while riding.

63.8 References

[1] *Sambucus nigra* at Flora Europaea

[2] "*Sambucus nigra*". Integrated Taxonomic Information System.

[3] *Sambucus nigra* at USDA PLANTS Database

[4] *RHS A-Z encyclopedia of garden plants.* United Michael and Vikram: Dorling Kindersley. 2008. p. 1136. ISBN 1405332964.

[5] "Sambucus mexicana". Calflora. Retrieved 2012-07-16.

An elder growing as an epiphyte on a sycamore

[6] "Sambucus nigra ssp. caerulea". Calflora. Retrieved 2012-07-16.

[7] Hackney, P. 1992. *Stewarts and Corry's Flora of the North-east of Ireland.* Institute of Irish Studies The Queen's University of Belfast. ISBN 0 85389 446 9(HB)

[8] Webb, D.A., Parnell, J. and Doogue, D. 1996. Dundalgan Press Ltd, Dundalk. ISBN 0-85221-131-7

[9] "RHS Plant Selector Sambucus nigra 'Aurea' AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2012-07-16.

[10] "RHS Plant Selector Sambucus nigra f. laciniata AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2012-07-16.

[11] "RHS Plant Selector Sambucus nigra f. porphyrophylla 'Gerda' PBR AGM / RHS Gardening". Apps.rhs.org.uk. Retrieved 2012-07-16.

[12] Professor Julia Morton, University of Miami

[13] Kikbracken, J. 1995. *Easy way guide Trees.* Larousse.

[14]

[15] "Mojave Desert Large Shrubs and Vines". Offroadinghome.djmed.net. Retrieved 2012-07-16.

[16] Zakay-Rones Z, Varsano N, Zlotnik M, Manor O, Regev L, Schlesinger M, Mumcuoglu M (1995). "Inhibition of Several Strains of Influenza Virus *in Vitro* and Reduction of Symptoms by an Elderberry Extract (*Sambucus nigra* L.) during an Outbreak of Influenza B Panama" (PDF). *J Altern Complement Med* **1** (4): 361–9. doi:10.1089/acm.1995.1.361. PMID 9395631. Retrieved September 8, 2009.

[17] Zakay-Rones Z, Thom E, Wollan T, Wadstein J (April 2004). "Randomized Study of the Efficacy and Safety of Oral Elderberry Extract in the Treatment of Influenza A and B Virus Infections" (PDF). *Journal of International Medical Research* **32** (2): 132–140. doi:10.1177/147323000403200205. PMID 15080016.

[18] Kinoshita E, Hayashi K, Katayama H, Hayashi T, Obata A (2012) [original online publication: 7 September 2012]. "Anti-influenza virus effects of elderberry juice and its fractions". *Bioscience, Biotechnology, and Biochemistry* **76** (9): 1633–1638. doi:10.1271/bbb.120112. PMID 22972323.

[19] Vogl S, Picker P, Mihaly-Bison J, Fakhrudin N, Atanasov AG, Heiss EH, Wawrosch C, Reznicek G, Dirsch VM, Saukel J, Kopp B (7 October 2013) [Epub ahead of print: 13 June 2013]. "Ethnopharmacological in vitro studies on Austria's folk medicine - An unexplored lore in vitro anti-inflammatory activities of 71 Austrian traditional herbal drugs". *J Ethnopharmacol* **149** (3): 750–771. doi:10.1016/j.jep.2013.06.007. PMC 3791396. PMID 23770053. doi:pii: S0378-8741(13)00410-8.

[20] Harokopakis E, Albzreh MH, Haase EM, Scannapieco FA, Hajishengallis G (February 2006). "Inhibition of Proinflammatory Activities of Major Periodontal Pathogens by Aqueous Extracts From Elder Flower (*Sambucus nigra*)". *Journal of Periodontology* **77** (2): 271–279. doi:10.1902/jop.2006.050232. Retrieved 2012-07-16.

[21] Badescu, Magda; Badulescu, Oana; Badescu, Laurentiu; Clocolu, Manuela (April 2015). "Effects of Sambucus nigra and Aronia melanocarpa extracts on immune system disorders within diabetes mellitus". *Pharmaceutical Biology* **53** (4): 533–539. doi:10.3109/13880209.2014.931441.

[22] Gray, Alison M.; Abdel-Wahab, Yasser H. A.; Flatt, Peter R. (1 January 2000). "The traditional plant treatment, Sambucus nigra (elder), exhibits insulin-like and insulin-releasing actions in vitro". *The American Society for Nutritional Sciences* **130** (1): 15-20. Retrieved 28 April 2015.

[23] CONSIDERATIONS

[24] *Sambucus nigra* at Germplasm Resources Information Network

[25] Campa C, Schmitt-Kopplin P, Cataldi TR, Bufo SA, Freitag D, Kettrup A (2000). "Analysis of cyanogenic glycosides by micellar capillary electrophoresis". *Journal of Chromatography B* **739**: 95–100. doi:10.1016/S0378-4347(99)00375-8. PMID 10744317.

63.8.1 Further reading

- Blanchan, Neltje (1900). *Wild Flowers: An Aid to Knowledge of our Wild Flowers and their Insect Visitors.* New York City: Doubleday. OCLC 16950204.
- Rushforth, K. (1999). Trees of Britain and Europe. HarperCollins ISBN 0-00-220013-9.
- Bratu, Mihaela Mirela; Doroftei, Elena; Negreanu-Pirjol, Ticuta; Hostina, Corina; Porta, Sepp (April 2012). "Determination of Antioxidant Activity and Toxicity of Sambucus nigra Fruit Extract Using Alternative Methods". *Food Technology and Biotechnology* **50** (2): 177-182. ISSN 1330-9862.

63.9 External links

- *Information about Black Elderberry*
- *Sambucol*

Chapter 64

Cornus sanguinea

The **common dogwood**, ***Cornus sanguinea***, is a species of dogwood native to most of Europe and western Asia, occurring north to southern England and southern Scandinavia, and east to the Caspian Sea. It is widely grown as an ornamental plant.

64.1 Description

It is a medium to large deciduous shrub, growing 2–6 metres (7–20 ft) tall, with dark greenish-brown branches and twigs. The leaves are opposite, 4–8 centimetres (2–3 in) long and 2–4 centimetres (0.8–1.6 in) broad, with an ovate to oblong shape and an entire margin; they are green above, slightly paler below, and rough with short stiff pubescence. The hermaphrodite flowers are small, 5–10 millimetres (0.2–0.4 in) diameter, with four creamy white petals, produced in clusters 3–5 centimetres (1–2 in) diameter, and are insect pollinated. The fruit is a globose black berry 5–8 millimetres (0.2–0.3 in) diameter, containing a single seed.*[1] The berries are sometimes called "dogberries".

64.2 Ecology

It prefers moderate warmth in sunny places, though it can tolerate shade and in the more southern areas of its distribution area grows in the mountains. In cooler areas such as Scandinavia it grows at sea level.

It requires light, often alkaline soils. The species spreads by seeds and stolons. Its natural range covers most of Europe and western Asia. It is especially abundant in riversides, especially in shady areas and ravines. It grows in the margins of forests or unforested areas as woods in regeneration, prickly woodland fringes, with other thorny shrub species (for example, *Clematis vitalba*, *Crataegus monogyna*, *Malus sylvestris*, *Prunus spinosa*, *Rubus idaeus* or *Rubus ulmifolius*).

It reproduces by seed and root sprouts, which makes it effective at occupying areas of land and forming dense groves. Depending on circumstances, it can be invasive.

64.3 Uses

The leaves provide food for some animals, including Lepidoptera such as the case-bearer moth *Coleophora anatipennella*. Dogberries are eaten by some mammals and many birds. Many frugivorous passerines find them irresistible, and prefer them over fruits grown by humans. The plant is thus often grown in organic gardening and permaculture to prevent harm to orchard crops, while benefitting from the fact that even frugivorous birds will hunt pest insects during the breeding season, as their young require much protein to grow.

Garden varieties are often called "winter fire" because the leaves turn orange-yellow in autumn and then fall to reveal striking red-tipped, orange-yellow winter stems.*[2]

The straight woody shoots produced by the plant can be used as prods, skewers or arrows. The prehistoric archer known as Ötzi the Iceman, discovered in 1991 on the border between Italy and Austria, was carrying arrow shafts

Cornus sanguinea *berries*

made from dogwood.*[3]

64.4 References

[1] "Cornus sanguinea". Plants For A Future. 1996–2008. Retrieved 2009-06-09.

[2] "Cornus sanguinea Midwinter Fire (Winter Beauty) - Dogwood". Gardening Express. 2009. Retrieved 2009-06-09.

[3] "Cornus sanguinea - Dogwood". First nature. 2009. Retrieved 2009-06-09.

Chapter 65

Sorbus rupicola

Sorbus rupicola, known as **rock whitebeam**,*[1] is a rare shrub or small tree best known from the British Isles but also reported from Norway, Sweden and Russia.*[2]

It can reach heights of 10 m.*[3] It grows in rocky woodland, scrub and cliffs, usually on limestone.*[3]

The species reproduces apomictically and was presumably created by autopolyploidysation of the common whitebeam proper (*Sorbus aria s.str.*). It contains a tetraploidal set of chromosomes (2n=4x=68).

A young specimen in Perthshire Scotland

Sorbus rupicola is a member of *Sorbus aria agg.*, which contains 20 subspecies. A key to this aggregate is given in Stace - though be warned Stace states "It is probably impossible to construct a reliable key to the agg."![*][3] Stace gives *Sorbus rupicola* the following characteristics:

- Leaves unlobed or lobed ≤1/20 of the way to the midrib.

Back of a leaf of a young specimen in Perthshire Scotland

- Leaves with a single style of teeth or, weakly, two styles of teeth.
- Leaves with 6 to 9 (rarely 4 to 10) pairs of lateral veins.
- Leaves mostly 1.6 to 2.4 times longer than wide.
- Leaves mostly widest in that half of the leaf furthest from the stalk.
- Leaves usually obtuse (rarely acute) at apex.
- Leaves have dense white hairs on lower surface.
- Fruits 10-15mm across, warty.

65.1 References

[1] "BSBI List 2007" (xls). Botanical Society of Britain and Ireland. Archived from the original on 2015-02-25. Retrieved 2014-10-17.

[2] "Ecological flora of the British Isles: Sorbus rupicola". Retrieved 2010-07-17.

[3] New Flora of the British Isles; Clive Stace; Third edition; 2011 printing

65.2 Further reading

- Ennos, R. A.; G. C. French; P. M. Hollingsworth (2005). "Conserving taxonomic complexity". *Trends in Ecology and Evolution* **20** (4): 164–8. doi:10.1016/j.tree.2005.01.012. PMID 16701363.

Upper surface of a leaf of a young specimen in Perthshire Scotland

- Robertson, A.; A. C. Newton; R. A. Ennos (2004). "Multiple hybrid origins, genetic diversity and population genetic structure of two endemic Sorbus taxa on the Isle of Arran, Scotland". *Molecular Ecology* **13** (1): 123–134. doi:10.1046/j.1365-294X.2003.02025.x. PMID 14653794.

65.3 External links

- Distribution map of *S. rupicola*. Naturhistoriska riksmuseet.

Upper surface of a leaf of a young specimen in Perthshire Scotland

Twig and part of a leaf of a young specimen in Perthshire Scotland

Chapter 66

Hippophae rhamnoides

Hippophae rhamnoides (**common sea-buckthorn**) is a species of flowering plant in the family Elaeagnaceae, native to fixed dunes and sea cliffs in Europe and Asia. It is a spiny deciduous shrub.

66.1 Description and biology

H. rhamnoides can grow 2–4 m (7–13 ft) high. The leaves are alternate, narrow and lanceolate, with silvery-green upper faces. It is dioecious, which means that the male and female flowers grow on different shrubs. The male inflorescence is built up of four to six flowers without petals. The female inflorescence consists normally of only one flower without petals and contains one ovary and one ovule. Male plants need to be planted near the female plants to allow fertilisation and fruit production. The oval or lightly roundish fruits grow in compact grapes varying from pale yellow to dark orange and weighing from 0.2 g to 1 g. The plant has a very developed root system that can maintain the soil on high slopes. The roots live in symbiosis with actinomycetes. This relationship permits fixation of nitrogen from the air. They also transform insoluble organic and mineral matters from the soil to more soluble states. The rhizomes sucker rapidly to produce new colonies.*[1]

66.2 Taxonomy

The Greek *rhamnoides* means "resembling buckthorn".*[2] As the buckthorns are in a different family, and the common name sea-buckthorn can refer to more than one species, it is preferable to refer to this plant by its unique Greek name.

66.3 Range

Hippophae rhamnoides is a native plant throughout Europe, including Britain, from Norway south and east to Spain and Asia to Japan and the Himalayas. It is grown as an agricultural plant in Germany,*[3] France,*[4] Finland, India and China. China is the largest agricultural producer.*[5] The origin of the plant is Nepal and it migrated to other parts of Eurasia after the last Ice Age.

66.4 Cultivation

It is also cultivated as an ornamental plant in gardens and parks.*[6]

66.5 Use

The fruits of sea buckthorn are used in a wide variety of products. Due to difficult harvest conditions and long ramp-up time of 6 to 8 years buckthorn is a relatively expensive raw material.

66.5.1 Food

Especially in France (southern Alps) sea buckthorn is commonly sold as fruit juice or as an ingredient in non-alcoholic and alcoholic mixed beverages. Other uses include the berries to be processed as fruit wine or into liquor as well as jam. Buckthorn tea is also made out of the fruits and originates from India.

The fruits have a very high vitamin C content, on average exceeding that of lemons and oranges.*[7]

66.5.2 Use in the traditional medicine

H. rhamnoides fruits have been used in the traditional Austrian medicine internally as tea, juice, or syrup for treatment of infections, colds, and flu.*[8]

66.5.3 Pharmacological activities

Various pharmacological activities such as cytoprotective, anti-stress, immunomodulatory, hepatoprotective, radio-protective, anti-atherogenic, anti-tumor, anti-microbial and tissue regeneration have been reported.*[9]

66.5.4 Agricultural engineering

Buckthorn is resistant to wind and frost, tolerates salty soils and has a wide-reaching root system. It is often used to stabilize sandy locations and as a pioneering plant on regosols.*[10]

66.6 Agricultural practices

66.6.1 Planting

Sea-buckthorn is normally planted as seedlings or sowed as seed in spring. It needs an adequate level of nutrients to produce a good yield and fruits of good quality. It responds well to phosphorus.*[1] The yield depends on the exposure to light; it does not tolerate shadow. Plants are normally planted 1.o to 1.5 m apart in rows 3 to 6 m between each other. The density of the plantings varies from 500 to 3300 plants per ha.*[1] AHANI et al., 2014 has produced this plants for the first time in Iran.

66.6.2 Plant protection

Relatively few diseases and insects are important on sea-buckthorn, but these are reported:

The disease **verticillium wilt** caused by *Verticillium albo-atrum* and *Verticillium dahliae* is widespread where sea-buckthorn is cultivated. The disease appears on trees five to eight years after planting. The infected fruits mature prematurely, dry up, and shrivel. Infected trees should be dug out and burned. For three to five years, it should not be planted at the same place. **Fusarium wilt** is another important disease in sea buckthorn. *Fusarium* spp. seems to only attack rotting and dying plants. Infected branches should be cut and burned.*[11]

Also, some insects affect sea-buckthorn: aphids, thrips, two-spotted mites, and earwigs. Gall ticks, leaf rollers, gypsy moths, and comma-shaped scale also cause damage to sea-buckthorn.*[11] The most damaging insect is the **sea buckthorn fly**. It penetrates the fruits and eats the flesh. The fruits are then unacceptable for use.*[11]

66.6.3 Weed control

Weed control is important, especially during the early growth stages. Sea-buckthorn grows slower than weeds because it has a less vigorous root system. Weeds should be removed before planting and then controlled during the first four to five years. Mechanical and hand cultivation are both used for weed control. Cultivation should not be too deep so as to not damage the roots.*[11]

66.7 See also

- Sea-buckthorn oil
- Wolfberry, another medicinal plant often mistaken for sea-buckthorn
- *Hippophae*

66.8 References

[1] Rousseau, Hélène (2002). *Développement des techniques de reproduction végétative et essais de cultivars d'argousiers*. Québec: Institut de recherche et de développement en agroenvironnement. pp. 1–12. ISBN 2-922851-16-8.

[2] *RHS A-Z encyclopedia of garden plants*. United Kingdom: Dorling Kindersley. 2008. ISBN 978-1-4053-3296-5.

[3] Information on cultivation of buckthorn in former East Germany (German)

[4] Information on cultivation of buckthorn in Franche (fr)

[5] Information on cultivation of buckthorn in China (fr)

[6] "*Hippophae rhamnoides*". *RHS Plant Finder*. Royal Horticultural Society. Retrieved 27 July 2013.

[7] Hussain, Iqbal; Khan, Lajber; Marwat, Gul Akhtar; Ahmed, Nazir; Saleem, Muhammad (2008). "Comparative Study of Vitamin C Contents in Fruits and Medicinal Plants" (PDF). *Journal of the Chemical Society of Pakistan* **30** (3): 406–9.

[8] Vogl, Sylvia; Picker, Paolo; Mihaly-Bison, Judit; Fakhrudin, Nanang; Atanasov, Atanas G.; Heiss, Elke H.; Wawrosch, Christoph; Reznicek, Gottfried et al. (2013). "Ethnopharmacological in vitro studies on Austria's folk medicine—An unexplored lore in vitro anti-inflammatory activities of 71 Austrian traditional herbal drugs". *Journal of Ethnopharmacology* **149** (3): 750–71. doi:10.1016/j.jep.2013.06.007. PMC 3791396. PMID 23770053.

[9] Suryakumar, Geetha; Gupta, Asheesh (2011). "Medicinal and therapeutic potential of Sea buckthorn (Hippophae rhamnoides L.)". *Journal of Ethnopharmacology* **138** (2): 268–78. doi:10.1016/j.jep.2011.09.024. PMID 21963559.

[10] Information on growing sea buckthorn from the University of Saskatchewan and the Saskatchewan Fruit Growers Association

[11] Thomas, S.C. Li (2003). *Sea buckthorn (Hippophae rhamnoides L.) : Production and Utilization*. Canada: National Research Council of Canada. ISBN 0-660-19007-9.

66.9 External links

HAVTORN, HIPPOPHAË RHAMNOIDES L.

Flowers of a male sea-buckthorn

Flowers of a female sea-buckthorn

Chapter 67

Euonymus europaeus

Euonymus europaeus (**spindle**, **European spindle**, **common spindle**) is a species of flowering plant in the family Celastraceae, native to much of Europe, where it inhabits the edges of forest, hedges and gentle slopes, tending to thrive on nutrient-rich, chalky and salt-poor soils. It is a deciduous shrub or small tree. Other names include fusoria, fusanum, ananbeam, shemshad rasmi (Iran), while it may have given its name to the ancient Greek settlement of Euonymeia.

67.1 Description

Close-up of a ripe fruit of Euonymus europaeus*, with the bright orange seeds*

Euonymus europaeus grows to 3–6 m (10–20 ft) tall, rarely 10 m (33 ft), with a stem up to 20 cm (8 in) in diameter. The leaves are opposite, lanceolate to elliptical, 3-8 cm long and 1-3 cm broad, with a finely serrated edge. Leaves are

dark green in summer. Fall color ranges from yellow-green to reddish-purple, depending on environmental conditions.*[1]

The hermaphrodite flowers are produced in late spring and are insect-pollinated; they are rather inconspicuous, small, yellowish green and grow in cymes of 3-8 together. The capsular fruit ripens in autumn, and is red to purple or pink in colour and approximately 1-1.5 cm wide. When ripe, the four lobes split open to reveal the orange seeds.

67.2 Cultivation and uses

It is a popular ornamental plant in gardens and parks due to its bright pink or purple fruits and attractive autumn colouring, in addition to its resistance to frost and wind. It has been introduced to North America where it has become an invasive species in some areas. The cultivar 'Red Cascade' has gained the Royal Horticultural Society's Award of Garden Merit.*[2]

European spindle wood is very hard, and can be cut to a sharp point; it was used in the past for making wool spindles.

Parts of the plant have been used medicinally.*[3] However, the fruit is poisonous, containing, amongst other substances, the alkaloids theobromine and caffeine, as well as an extremely bitter terpene. Poisonings are more common in young children, who are enticed by the brightly coloured fruits. Ingestion can result in liver and kidney damage and even death .

67.3 Synonyms

- *Euonymus multiflorus* Opiz ex Bercht. [1838]
- *Euonymus floribundus* Steven [1856]
- *Euonymus europaeus var. macrophyllus* Rchb.
- *Euonymus europaeus var. intermedius* Gaudin
- *Euonymus bulgaricus* Velen. [1891]
- *Euonymus vulgaris* Mill. [1768]
- *Euonymus angustifolius* Clairv.*[4]

67.4 Gallery

- Figure from Flora von Deutschland, Österreich und der Schweiz, 1885
- Flower of *Euonymus europaeus*, with the four petals and four stamens
- Fruits of *Euonymus europaeus*
- Close-up on a fruit of *Euonymus europaeus*
- Leaf of *Euonymus europaeus*
- Tree of *Euonymus europaeus*

67.5 References

[1] Dirr, Michael A. 1998. Manual of Woody Landscape Plants, 5th edi

[2] "*Euonymus europaeus* 'Red Cascade' AGM" . Royal Horticultural Society. Retrieved 26 July 2013.

[3] Plants for a Future: *Euonymus europaeus*

[4] Tela Botánica

67.6 External links

- "Spindle Wood (Euonymus Europaeus, L.)". *British Wild Flowers*. Chest of Books. 2009. Retrieved 2009-09-24.
- "Euonymus europaeus L. European spindletree". *Natural Resources Conservation Service*. US Department of Agriculture. 2009. Retrieved 2009-09-24.
- "Euonymus europaeus European Euonymus Celastraceae". *University of Connecticut Plant Database*. University of Connecticut. Retrieved 2009-09-24.

Chapter 68

Salix caprea

"Goat Willow" redirects here. For the song by Hawkwind, see Hall of the Mountain Grill.

Salix caprea (**goat willow**, also known as the **pussy willow** or **great sallow**) is a common species of willow native to Europe and western and central Asia.*[1]

It is a deciduous shrub or small tree, reaching a height of 8–10 m (26–33 ft), rarely to 13 m. The leaves are 3-12 cm long and from 2-8 cm wide, broader than most other willows. The flowers are soft silky, and silvery 3-7-cm-long catkins are produced in early spring before the new leaves appear; the male and female catkins are on different plants (dioecious). The male catkins mature yellow at pollen release, the female catkins mature pale green. The fruit is a small capsule 5-10 mm long containing numerous minute seeds embedded in fine, cottony hairs. The seeds are very small (about 0.2 mm) with the fine hairs aiding dispersal; they require bare soil to germinate.*[1]*[2]

The two varieties are:*[1]

- *S. c.* var. *caprea* - lowland regions throughout the range, leaves thinly hairy above, densely hairy below, 5-12 cm long, stipules persistent until autumn

- *S. c.* var. *sphacelata* (Sm.) Wahlenb. (syn. *S. caprea* var. *coaetanea* Hartm.; *S. coaetanea* (Hartm.) Floderus) - high altitudes in the mountains of central and northern Europe (Alps, Carpathians, Scotland, Scandinavia), leaves densely silky-hairy on both sides, 3-7 cm long, stipules early deciduous

The scientific name, and the common name goat willow, probably derive from the first known illustration of the species in Hieronymus Bock's 1546 *Herbal*, where the plant is shown being browsed by a goat. The species was historically also widely used as a browse for goats, to which Bock's illustration may refer.*[3]

68.1 Ecology

S. caprea occurs both in wet environments, such as riverbanks and lake shores, and in drier sites, wherever bare soil becomes available due to ground disturbance.*[1]

Hybrids with several other willow species are common, notably with *Salix cinerea* (*S.* × *reichardtii*), *Salix aurita* (*S.* × *multinervis*), *Salix viminalis* (*S.* × *smithiana*), and *Salix purpurea* (*S.* × *sordida*). Populations of *S. caprea* often show hybrid introgression.*[1]*[2]

Unlike almost all other willows, pure specimens do not take root readily from cuttings; if a willow resembling the species does root easily, it is probably a hybrid with another species of willow.*[2]

The leaves are used as a food resource by several species of Lepidoptera, and are also commonly eaten by browsing mammals. Willows are very susceptible to gall inducers, and the midge *Rhabdophaga rosaria* forms the camellia gall on *S. caprea*.*[4]

Male catkins

68.2 Cultivation and uses

A small number of cultivars have been selected for garden use. The most common is *S. caprea* 'Kilmarnock', with stiffly pendulous shoots, forming a mop-head; it is a male clone. A similar female clone is *S. caprea* 'Weeping Sally'. As they do not form a leader, they are grafted on erect stems of other willows; the height of these cultivars is determined by the height at which the graft is made.*[2] Plants can also be grown from greenwood cuttings, which make attractive creeping mounds. Hardwood cuttings are often difficult to root.

Both tannin and salicin can be extracted from goat willow bark. The tree is not considered a good source of timber, as its wood is both brittle and known to crackle violently if burned.

As with the closely related *Salix discolor* (American pussy willow), it is also often grown for cut flowers. See Pussy willow for further cultural information, which apply to both species.

In Scandinavia it has been fairly common to make willow flutes from goat willow cuttings.

68.3 References

[1] Meikle, R. D. (1984). *Willows and Poplars of Great Britain and Ireland*. BSBI Handbook 4. ISBN 0-901158-07-0.

[2] Rushforth, K. (1999). *Trees of Britain and Europe*. Collins. ISBN 0-00-220013-9.

[3] Bean, W. J. (1980). *Trees and Shrubs Hardy in the British Isles*. ISBN 0-7195-2428-8.

[4] Gall Inducers

68.4 External links

- *Salix caprea* at the Encyclopedia of Life

Chapter 69

Salix cinerea

Salix cinerea (**grey willow**; also occasionally grey sallow) is a species of willow native to Europe and western Asia.*[1]*[2]

69.1 Plant

It is a deciduous shrub or small tree growing to 4–15 m (13–49 ft) high. The leaves are spirally arranged, 2–9 cm long and 1–3 cm broad (exceptionally up to 16 cm long and 5 cm broad), green above, hairy below, with a crenate margin. The flowers are produced in early spring in catkins 2–5 cm long; it is dioecious with male and female catkins on separate plants. The male catkins are silvery at first, turning yellow when the pollen is released; the female catkins are greenish-grey, maturing in early summer to release the numerous tiny seeds embedded in white cottony down which assists wind dispersal.*[1]*[2]

The two subspecies are:*[1]*[2]

- *S. c. cinerea* - central and eastern Europe, western Asia, shrub to 4–6 m (rarely 10 m) tall, with smooth bark, leaves densely hairy below with pale yellow-grey hairs, stipules large, persistent until autumn
- *S. c. oleifolia* (Sm.) Macreight (syn. *S. atrocinerea* Brot.) - western Europe, northwest Africa, shrub or tree to 10–15 m tall, with furrowed bark, leaves thinly hairy below with dark red-brown hairs, stipules small, early deciduous

Some overlap in the distributions (not indicated in the map, right) occurs, with both occurring in a broad band north to south through France, and scattered specimens of *S. c. cinerea* west to Ireland, western France, and Morocco; scattered specimens of *S. c. oleifolia* occur east to the Netherlands. Specimens of *S. c. oleifolia* in southern Scandinavia are planted or naturalised, not native. Intermediate specimens also occur.*[1]*[2]

69.2 Ecology

It usually grows in wetlands. The two subspecies differ slightly in requirements, with *S. c. cinerea* generally restricted to basic marshland and fen habitats, while *S. c. oleifolia* is less demanding, occurring in both alkaline marshes and acidic bogs and streamsides.*[1] A common herbivore of Salix cinerea is Phratora vulgatissima, which prefers and is more common on female plants.*[3] Anthocoris nemorum, a natural enemy of Phratora vulgatissima, is also more common on S. cinerea.*[3]

69.3 Invasive species

S. cinerea is an invasive species in New Zealand and is listed on the National Pest Plant Accord, which means it cannot be sold or distributed.

Close-ups of Salicaceae flowers,

69.4 References

[1] Meikle, R. D. (1984). *Willows and Poplars of Great Britain and Ireland*. BSBI Handbook No. 4. ISBN 0-901158-07-0.

[2] Christensen, K. I., & Nielsen, H. (1992). Rust-pil (*Salix cinerea* subsp. *oleifolia*) - en overset pil i Danmark og Skandinavien. *Dansk Dendrologisk Årsskrift* 10: 5-17.

Salix cinerea *seeds on a birch tree branch*

[3] Kabir, Faisal MD; Moritz, Kim K; Stenberg, Johan A (2015-04-19). "Plant-sex-biased tritrophic interactions on dioecious willow". *Ecosphere*. doi:10.1890/ES14-00356.1.

Chapter 70

Salix purpurea

Salix purpurea (**purple willow**[*] [1] or **purple osier**) is a species of willow native to most of Europe and western Asia north to the British Isles, Poland, and the Baltic States.[*] [2][*] [3][*] [4]

Foliage

It is a deciduous shrub growing to 1-3 m (rarely to 5 m) tall, with purple-brown to yellow-brown shoots, turning pale grey on old stems. The leaves are 2-8 cm (rarely to 12 cm) long and 0.3-1 cm (rarely 2 cm) wide; they are dark green above, glaucous green below, and unusually for a willow, are often arranged in opposite pairs rather than alternate. The flowers are small catkins 1.5-4.5 cm long, produced in early spring; they are often purple or red in colour, whence the name of the species (other willows mostly have whitish, yellow or green catkins).

The wood of this species is used in making cricket bats.[*] [3][*] [4]

It is replaced further east in Asia by the closely related species *Salix sinopurpurea* (syn. *S. purpurea* var. *longipetiolatea*).[*] [5]

As with several other willows, the shoots, called withies, are often used in basketry.*[4]

70.1 References

[1] "BSBI List 2007". Botanical Society of Britain and Ireland. Archived from the original (XLS) on 2015-02-25. Retrieved 2014-10-17.

[2] Flora Europaea: *Salix purpurea*

[3] Meikle, R. D. (1984). *Willows and Poplars of Great Britain and Ireland*. BSBI Handbook No. 4. ISBN 0-901158-07-0.

[4] Rushforth, K. (1999). *Trees of Britain and Europe*. Collins ISBN 0-00-220013-9.

[5] Flora of China: *Salix sinopurpurea*

Chapter 71

Salix viminalis

Salix viminalis, the **common osier** or **osier**, is a species of willow native to Europe and western Asia.*[1]*[2]*[3]

71.1 Description

Salix viminalis is a multistemmed shrub growing to between 3 and 6 m (9.8 and 19.7 ft) (rarely to 10 m (33 ft)) tall. It has long, erect, straight branches with greenish-grey bark. The leaves long and slender, 10–25 cm long but only 0.5–2 cm broad; they are dark green above, with a silky grey-haired underside. The flowers are catkins, produced in early spring before the leaves; they are dioecious, with male and female catkins on separate plants. The male catkins are yellow and oval-shaped; the female catkins are longer and more cylindrical; they mature in early summer when the fruit capsules split open to release the numerous minute seeds.*[1]*[2]

71.2 Distribution and habitat

It is commonly found by streams and other wet places. The exact native range is uncertain due to extensive historical cultivation; it is certainly native from central Europe east to western Asia, but may also be native as far west as southeastern England. As a cultivated or naturalised plant, it is widespread throughout both Britain and Ireland, but only at lower altitudes. It is one of the least variable willows, but it will hybridise with several other species.*[1]*[2]

71.3 Uses

Along with other related willows, the flexible twigs (called withies) are commonly used in basketry, giving rise to its alternative common name of "basket willow". In the Chilean village of Chimbarongo, it is used to fashion the renowned baskets.

Another increasing use is in energy forestry,*[1] effluent treatment, in wastewater gardens, and in cadmium phytoremediation for water purification.*[3]

S. viminalis is a known hyperaccumulator of cadmium, chromium, lead, mercury, petroleum hydrocarbons, organic solvents, MTBE, TCE and byproducts, selenium, silver, uranium, and zinc,*[4]*[5] and Potassium ferrocyanide (tried on *S. babylonica* L.),*[6] and as such is a prime candidate for phytoremediation. For more information, see the list of hyperaccumulators.

71.4 References

[1] Meikle, R. D. (1984). *Willows and Poplars of Great Britain and Ireland*. BSBI Handbook No. 4. ISBN 0-901158-07-0.

[2] Rushforth, K. (1999). *Trees of Britain and Europe*. Collins ISBN 0-00-220013-9.

[3] Perttu, K. L. and Kowalik, P. J. (1997). *Salix vegetation filters for purification of waters and soils*. Biomass and Bioenergy, Volume 12, Issue 1, 1997, Pages 9-19. Elsevier Science Ltd.

[4] *Phytoremediation.* By McCutcheon & Schnoor. 2003, New Jersey, John Wiley & Sons, page 19.

[5] *Enhancing Phytoextraction: The Effect of Chemical Soil Manipulation on Mobility, Plant Accumulation, and Leaching of Heavy Metals.* By Ulrich Schmidt. In J. Environ. Qual. 32:1939-1954 (2003).

[6] *The potential for phytoremediation of iron cyanide complex by Willows.* By X.Z. Yu, P.H. Zhou and Y.M. Yang. In Ecotoxicology 2006.

Chapter 72

Salix aurita

Salix aurita (**eared willow**) is a species of willow distributed over much of Europe, and occasionally cultivated. It is a shrub to 2.5 m in height, distinguished from the similar but slightly larger *Salix cinerea* by its reddish petioles and young twigs. It was named for its persistent kidney-shaped stipules along the shoots.

Salbei-Weide, Salix aurita.

Chapter 73

Viburnum opulus

Viburnum opulus (common name **guelder-rose**[*] [1]) is a species of flowering plant in the family Adoxaceae (formerly Caprifoliaceae) native to Europe, northern Africa and central Asia.[*] [2]

73.1 Names

Viburnum opulus Sterilis

The common name 'guelder rose' relates to the Dutch province of Gelderland, where a popular cultivar, the snowball tree, supposedly originated.[*] [3] Other common names include **water elder**, **cramp bark**, **snowball tree** and **European cranberry bush**, though this plant is not closely related to the cranberry. Some botanists also include the North American species *Viburnum trilobum* as *V. opulus* var. *americanum* Ait., or as *V. opulus* subsp. *trilobum* (Marshall) Clausen.

73.2 Description

Flowers (left) and fruit

V. opulus is a deciduous shrub growing to 4–5 m (13–16 ft) tall. The leaves are opposite, three-lobed, 5–10 cm (2–4 in) long and broad, with a rounded base and coarsely serrated margins; they are superficially similar to the leaves of some maples, most easily distinguished by their somewhat wrinkled surface with impressed leaf venation. The leaf buds are green, with valvate bud scales.

The hermaphrodite flowers are white, produced in corymbs 4–11 cm (2–4 in) in diameter at the top of the stems; each corymb comprises a ring of outer sterile flowers 1.5–2 cm in diameter with conspicuous petals, surrounding a center of small (5 mm), fertile flowers; the flowers are produced in early summer, and pollinated by insects. The fruit is a globose bright red drupe 7–10 mm diameter, containing a single seed. The seeds are dispersed by birds.

73.3 Cultivation

V. opulus is grown as an ornamental plant for its flowers and berries, growing best on moist, moderately alkaline soils, though tolerating most soil types well. Several cultivars have been selected, including 'Roseum' (synonym 'Sterile', 'Snowball'), in which all the flowers are only of the larger sterile type, with globular flower heads. There is some confusion, as there are a few other plants, including other members of the *Viburnum* genus, also referred to as "snowball bush".

The shrub is also cultivated as a component of hedgerows, cover plantings, and as part of other naturalistic plantings in its native regions.

It is naturalised in North America, where it has been misleadingly renamed "European Cranberrybush" (it is not a cranberry).

The cultivars 'Compactum',*[4] 'Roseum'*[5] and 'Xanthocarpum'*[6] have gained the Royal Horticultural Society's Award of Garden Merit.

73.4 Other uses

The fruit is edible in small quantities, with a very acidic taste; it can be used to make jelly. It is however very mildly toxic, and may cause vomiting or diarrhea if eaten in large amounts.*[7]

The term cramp bark is related to the properties of the bark's ability to reduce smooth muscle tightness. It is called cramp bark as relieving this type of muscle tightness is most often associated with relieving women's menstrual (period) cramps. However, this can also be used during pregnancy for cramps or pain and general muscle cramping.*[8]

73.5 Cultural meaning

Viburnum opulus (Kalyna) is one of the National symbols of Ukraine.*[9] Mentions of the bush can be found throughout the Ukrainian folklore such as songs, picturesque art, Ukrainian embroidery, and others. *Chervona Kalyna* was the anthem of the Ukrainian Insurgent Army. Kalyna Country is an ecomuseum in Canada.

This bush's symbolic roots can be traced to the Slavic paganism of millennia ago. According to a legend Kalyna was associated with the birth of the Universe, the so-called *Fire Trinity*: the Sun, the Moon, and the Star.*[10]*[11] Its berries symbolize blood and the undying trace of family roots. Kalyna is often depicted on the Ukrainian embroidery: towels and shirts. In Slavic paganism kalyna also represents the beauty of a young lady which rhymes well in the Ukrainian language: Ka-ly-na - Div-chy-na.*[12]*[13]*[14] That consistency was reviewed by numerous Ukrainian folklorists such as Nikolay Kostomarov, Oleksandr Potebnia (founder of the *Kharkiv Linguistic School*).

73.6 References

[1] "BSBI List 2007" (XLS). Botanical Society of Britain and Ireland. Retrieved 2014-10-17.

[2] *RHS A-Z encyclopedia of garden plants*. United Kingdom: Dorling Kindersley. 2008. p. 1136. ISBN 1405332964.

[3] The Reader's Digest Field Guide to the Trees and Shrubs of Britain *p.143*.

[4] "RHS Plant Selector - *Viburnum opulus* 'Compactum'". Retrieved 8 June 2013.

[5] "RHS Plant Selector - *Viburnum opulus* 'Roseum'". Retrieved 8 June 2013.

[6] "RHS Plant Selector - *Viburnum opulus* 'Xanthocarpum'". Retrieved 8 June 2013.

[7] Plants for a Future database

[8] CRAMP BARK: Uses, Side Effects, Interactions and Warnings - WebMD

[9] Peacebuilding with Women in Ukraine: Using Narrative to Envision a Common Future by Maureen Flaherty, Lexington Books, 2012, ISBN 0739174045 (page 172)

[10] Lady of Prykarpattia (Ukrainian)

[11] Ukrainian embroidery (Ukrainian)

[12] Doctor Bozhko, Agrarian Sciences. *Trees in culture by folk*. (Ukrainian)

[13] Doctor Kuzmenko, Philological Sciences. *The symbolics of guilder rose in Ukrainian songs of the 20th century national liberating movements*. (English)/(Ukrainian)

[14] a kalyna ne verba-live(Natalka Karpa) (youtube)

1. Blamey, M. & Grey-Wilson, C. (1989). *Flora of Britain and Northern Europe*. Hodder & Stoughton.
2. Huxley, A., ed. (1992). *New RHS Dictionary of Gardening*. Macmillan.
3. Flora Europaea: *Viburnum opulus*
4. Plants for a Future: *Viburnum opulus*

Chapter 74

Viburnum lantana

Viburnum lantana (**Wayfarer** or **Wayfaring Tree**) is a species of *Viburnum*, native to central, southern and western Europe (north to Yorkshire in England), northwest Africa, and southwestern Asia.*[1]*[2]*[3] The vigorous deciduous European treelike shrub is common along waysides.

It is a deciduous shrub or small tree growing to 4–5 m tall. The leaves are opposite, simple oval to lanceolate, 6–13 cm wide and 4–9 cm broad, with a finely serrated margin; they are densely downy on the underside, less so on the upper surface. The hermaphrodite flowers are small (5 mm), creamy-white, produced in dense cymes 4–10 cm width at the top of the stems; they are produced in early summer, and pollinated by insects. The fruit is an oblong drupe 8 mm long, green at first, turning red, then finally black at full maturity, and contains a single seed. The seeds are dispersed when birds eat the fruit, then deposit the seeds in another location in their droppings.*[2]*[3]

An older name for the plant is hoarwithy. "Hoar" means grey-haired and refers to the hairs under the leaves, and "withy" means a pliant stem.*[4]

74.1 Cultivation and uses

It is commonly grown as an ornamental plant for its flowers and berries, growing best on alkaline soils. A number of cultivars have been selected, including 'Aureum', with yellow leaves in spring.*[3]

The fruit is mildly toxic, and may cause vomiting or diarrhea if consumed in large quantities.*[5]

74.2 References

[1] Flora Europaea: *Viburnum lantana*

[2] Blamey, M. & Grey-Wilson, C. (1989). *Flora of Britain and Northern Europe*. ISBN 0-340-40170-2

[3] Huxley, A., ed. (1992). *New RHS Dictionary of Gardening*. Macmillan ISBN 0-333-47494-5.

[4] Reader's Digest Field Guide to the Trees and Shrubs of Britain *p.87*.

[5] Plants for a Future: *Viburnum lantana*

Chapter 75

Ligustrum vulgare

Ligustrum vulgare (**wild privet**, also sometimes known as **common privet** or **European privet**), is a species of *Ligustrum* native to central and southern Europe, north Africa and southwestern Asia, from Ireland and southwestern Sweden south to Morocco, and east to Poland and northwestern Iran.*[1]*[2]*[3]*[4]*[5]

Berries

It is a semi-evergreen or deciduous shrub, growing to 3 m (rarely up to 5 m) tall. The stems are stiff, erect, with grey-brown bark spotted with small brown lenticels. The leaves are borne in decussate opposite pairs, sub-shiny green, narrow oval to lanceolate, 2–6 cm long and 0.5–1.5 cm broad. The flowers are produced in mid summer in panicles 3–6 cm long, each flower creamy-white, with a tubular base and a four-lobed corolla ('petals') 4–6 mm diameter. The flowers produce a strong, pungent fragrance that many people find unpleasant. The fruit is a small glossy black berry 6–8 mm diameter, containing one to four seeds. The berries are poisonous to humans but readily eaten by thrushes, which disperse the seeds in their droppings.*[4]*[5]*[6]

Plants from the warmer parts of the range show a stronger tendency to be fully evergreen; these have sometimes been treated as a separate variety *Ligustrum vulgare* var. *italicum* (Mill.) Vahl,*[5] but others do not regard it as distinct.*[1]

In the British Isles it is the only native privet, common in hedgerows and woodlands in southern England and Wales,

especially in chalk areas; it is less common in northern England, Scotland, and Northern Ireland, where it only occurs as an escape from cultivation.[*][5][*][7][*][8]

75.1 Cultivation and uses

The species was used for hedging in Elizabethan gardens in England, but was superseded by the more reliably evergreen introduction *L. ovalifolium* from Japan.[*][7]

A number of cultivars have been selected, including:[*][5]

- 'Aureum' – yellow leaves.
- 'Buxifolium' – small, oval leaves not over 2.5 cm long.
- 'Cheyenne' – cold-tolerant clone selected in North America.
- 'Chlorocarpum' - berries green.
- 'Insulense' – long, narrow leaves 5–11 cm long and 1-2.5 cm broad.
- 'Leucocarpum' – berries greenish-white.
- 'Lodense' – dense, dwarf shrub (the name is a portmanteau of 'low' and 'dense').
- 'Pyramidale' – fastigiate.
- 'Xanthocarpum' – berries yellow.

75.2 Invasiveness

The species is listed as invasive as an introduced plant in Australia,[*][9] Canada,[*][10] New Zealand,[*][11] and the United States.[*][12][*][13] It is also fully naturalised in Mexico's highlands[*][14] and Argentina.[*][15]

75.3 Gallery

-
-
-
-
-

75.4 References

[1] Flora Europaea: *Ligustrum vulgare*

[2] Plants for a Future: *Ligustrum vulgare*

[3] Germplasm Resources Information Network: *Ligustrum vulgare*

[4] Blamey, M. & Grey-Wilson, C. (1989). *Flora of Britain and Northern Europe*. ISBN 0-340-40170-2

[5] Bean, W. J. (1978). *Trees and Shrubs Hardy in the British Isles* vol. 2: 576-577. ISBN 0-7195-2256-0.

[6] Flora of Northwest Europe: *Ligustrum vulgare*

[7] The Reader's Digest Field Guide to the Trees and Shrubs of Britain *p.52*.

[8] Flora of Northern Ireland: *Ligustrum vulgare*

[9] Potential Environmental Weeds in Australia: Appendix C

[10] Canadian Botanical Conservation Network: Information on Invasive Shrub and Vine Species

[11] Protecting and Restoring our Natural Heritage: Appendix one: Invasive weeds

[12] Swearingen, Jil; Reshetiloff, K.; Slattery, B; Zwicker, S. (2010). *Plant Invaders of Mid-Atlantic Natural Areas, 4th Edition*. National Park Service and U.S. Fish & Wildlife Service. p. 71.

[13] Invasive species: European privet

[14] Plantas medicinales. Virtudes insospechadas de plantas conocidas. 1987. Reader's Digest México S.A. de C.V. Printed by Gráficas Monte Albán S.A. de C.V. Querétaro, Mexico. ISBN 968-28-0099-4

[15] Gavier-Pizarro, Gregorio I.; Kuemmerle, Tobias; Hoyos, Laura E.; Stewart, Susan I.; Huebner, Cynthia D.; Keuler, Nicholas S.; Radeloff, Volker C. 2012. Monitoring the invasion of an exotic tree (*Ligustrum lucidum*) from 1983 to 2006 with Landsat TM/ETM+ satellite data and support vector machines in Cordoba, Argentina. Remote Sensing of Environment. 122: 134-145.

75.5 Text and image sources, contributors, and licenses

75.5.1 Text

- **Alder** *Source:* http://en.wikipedia.org/wiki/Alder?oldid=664676178 *Contributors:* Koyaanis Qatsi, SimonP, GTBacchus, Keichwa, TUF-KAT, Tjunier, Marshman, Imc, Pollinator, Donarreiskoffer, Robbot, Kristof vt, WormRunner, Altenmann, Texture, Meelar, Hadal, UtherSRG, Alan Liefting, DocWatson42, MPF, Wiglaf, Tom Radulovich, Xinoph, Lakefall~enwiki, Knutux, Yath, Quadell, JoJan, Karl-Henner, Demiurge, Esperant, Moverton, Guanabot, RJHall, Mikcohen, Bendono, Circeus, Hesperian, Jumbuck, AnnaP, Arthena, SteinbDJ, Kazvorpal, Adrian.benko, Japanese Searobin, Jef-Infojef, Stemonitis, Woohookitty, Richard Barlow, Uncle G, Lupinelawyer, Chochopk, MONGO, Kelisi, Paradon, Isnow, Mandarax, Jlundell, Bubba73, The wub, FlaBot, Eubot, Hottentot, Chobot, Gdrbot, YurikBot, RobotE, WayneRay, CambridgeBayWeather, Dysmorodrepanis~enwiki, Bloodofox, AndrewC, 24ip, CorbieVreccan, CLW, Lt-wiki-bot, SmackBot, Tom Lougheed, Hmains, Rkitko, SB Johnny, Salvor, Bazonka, Gruzd, NaySay, AndyBQ, Vina-iwbot~enwiki, Bejnar, Xerocs, Axem Titanium, Bjankuloski06en~enwiki, Ben Moore, Fluppy, MTSbot~enwiki, WeggeBot, Slazenger, Rosser1954, Thijs!bot, Evelyn Z, RoboServien, Escarbot, Luna Santin, Nipisiquit, Storkk, JAnDbot, Plantsurfer, Krasanen, MegX, Magioladitis, VoABot II, BilCat, CommonsDelinker, Nono64, J.delanoy, Biglovinb, Bakerthepancake, Treisijs, Tevonic, AndrewKozak, Idioma-bot, VolkovBot, Philip Trueman, TXiKiBoT, Piperh, Risby, Jackfork, Raymondwinn, Synthebot, AlleborgoBot, Atubeileh, SieBot, Smf5000, BenoniBot~enwiki, Jludwig, Lascorz, ClueBot, Jagun, Arakunem, Drmies, Alexbot, Thingg, DerBorg, Editor2020, Download, AnnaFrance, Numbo3-bot, Tide rolls, مانع, Legobot, Luckas-bot, Yobot, Luce nordica, Anne McDermott, 1exec1, JackieBot, MauritsBot, Xqbot, Apothecia, GrouchoBot, Urjanhai, Tobyhanna, FrescoBot, LucienBOT, Pelmeen10, RedBot, RyanDPD, Monsterparty, Mono, Dinamik-bot, Vrenator, Ripchip Bot, Thiridaz, Darwinerasmus, EmausBot, WikitanvirBot, Tommy2010, JeffreyTJoseph, ZéroBot, Matthewcgirling, Monterey Bay, ChuispastonBot, Petrb, ClueBot NG, Cwmhiraeth, Bped1985, D5e5, Helpful Pixie Bot, M0rphzone, ISTB351, Insidiae, Klilidiplomus, Lieutenant of Melkor, Darorcilmir, ChrisGualtieri, Mogism, Lugia2453, Brent1023, Thomasdude1, No1inparticularhere, Samrong01, Joseph Laferriere, Chrusses, Catobonus, Tor3322 and Anonymous: 116

- **Apple** *Source:* http://en.wikipedia.org/wiki/Apple?oldid=664920876 *Contributors:* AxelBoldt, Kpjas, Vicki Rosenzweig, Mav, Koyaanis Qatsi, Andre Engels, Hajhouse, Arvindn, Rmhermen, PierreAbbat, Karen Johnson, William Avery, Roadrunner, SimonP, Ellmist, Rcingham, Heron, Sfdan, Quercusrobur, DennisDaniels, Nommonomanac, D, Smelialichu, HollyAm, Tim Starling, Llywrch, Fuzzie, Mahjongg, Karl, MartinHarper, Taras, Ixfd64, IZAK, Dori, Minesweeper, Pcb21, Kosebamse, Tregoweth, Looxix~enwiki, Ahoerstemeier, Haakon, Ronz, Jimfbleak, Arwel Parry, CatherineMunro, TUF-KAT, TUF-KAT, Den fjättrade ankan~enwiki, DropDeadGorgias, Julesd, Glenn, Jschwa1, Error, Poor Yorick, Andres, Samw, Lukobe, Lee M, GRAHAMUK, Conti, Mulad, Kat, Popsracer, Pti, RickK, Colipon, Jay, Fuzheado, Wik, Haukurth, Tpbradbury, Marshman, Motor, Maximus Rex, Tempshill, Karukera, Spikey, HarryHenryGebel, Gakrivas, Johnleemk, Finlay McWalter, Pollinator, Denelson83, Jni, Donarreiskoffer, Catskul, Nufy8, Robbot, Ke4roh, Hankwang, Rbruels, Jredmond, WormRunner, Netizen, Naddy, Mayooranathan, Ashley Y, Academic Challenger, Dersonlwd, Hemanshu, Texture, Jfire, Yacht, Caknuck, Bkell, Hadal, Wikibot, Profoss, Mushroom, Lupo, Dmn, Nick Pisarro, Jr., Dina, DigitalMedievalist, Craig Butz, Srtxg, Dave6, Giftlite, Smjg, DocWatson42, MPF, Kerttie, Everdred, DaB., BenFrantzDale, Wiglaf, Tom harrison, Folks at 137, Lupin, Peruvianllama, Ds13, Everyking, No Guru, Curps, Hecatonchires, Cantus, Guanaco, Yekrats, Finn-Zoltan, Mboverload, Falcon Kirtaran, Matt Crypto, Nigelquinine, Oklonia, Geoffspear, Utcursch, Andycjp, R. fiend, Gdr, Yath, Steschke, Quadell, Antandrus, Bgbot, Beland, OverlordQ, JoJan, Quarl, Savant1984, ShakataGaNai, Jossi, MacGyverMagic, Andyabides, BrandonR, DragonflySixtyseven, Maximaximax, Glogger, Kevin B12, Karl-Henner, Sam Hocevar, Biot, Stilroc, Jazbell, TreyHarris, TonyW, JulieADriver, Marcus2, Joyous!, Imjustmatthew, Wyllium, Aknorals, Syvanen, Kevyn, Adashiel, Trevor MacInnis, Famartin, Grstain, Mike Rosoft, Anglerud, Freakofnurture, Heegoop, AliveFreeHappy, Haiduc, DanielCD, Edolen1, Discospinster, Brianhe, ElTyrant, Rich Farmbrough, Guanabot, Sladen, Wng, Cacycle, TomPreuss, Cnwb, Vsmith, Rasmusdf, Eric Shalov, Xezbeth, Martpol, Paul August, Bender235, Rubicon, ESkog, Lou Crazy, Kaisershatner, JoeSmack, Soulresin, Elwikipedista~enwiki, Aranel, Uli, CanisRufus, Aecis, El C, Fenevad, Mwanner, Surachit, Aude, Shanes, Sietse Snel, Art LaPella, RoyBoy, Chillmann, Jpgordon, Causa sui, Bobo192, NetBot, Harley peters, Fir0002, Smalljim, BrokenSegue, Mtruch, Shenme, Wisdom89, Elipongo, Cohesion, La goutte de pluie, TheProject, Bleh fu, Roy da Vinci, Rje, John Fader, Maxl, Sam Korn, Haham hanuka, Ral315, Benbread, Jonathunder, Ranveig, Storm Rider, Kevin in STL, Red Winged Duck, Stephen G. Brown, Alansohn, Gary, Sheehan, GenkiNeko, Carbon Caryatid, Andrewpmk, Riana, AzaToth, Axl, Lightdarkness, Seans Potato Business, Sligocki, Mac Davis, Honeydew, InShaneee, Cdc, Mysdaao, Malo, Bart133, Caesura, Yossiea~enwiki, Melaen, Saga City, Almafeta, *Kat*, Garzo, Max Naylor, Amorymeltzer, Infobacker, Henry W. Schmitt, Krellion, Blaxthos, HenryLi, Kazvorpal, Joaquin~enwiki, Geodejerry, Sidney Gould, Vanished user dfvkjmet9jweflkmdkcn234, Komodo~enwiki, JeffTK, Boothy443, Richard Arthur Norton (1958-), Pekinensis, Bushytails, OwenX, Woohookitty, Richard Barlow, TigerShark, Camw, LOL, Muya, Ukulele~enwiki, Zis~enwiki, Plek, Madchester, Robwingfield, WadeSimMiser, MONGO, Jwanders, Rickjpelleg, Zakharov, Miss Madeline, Tabletop, CiTrusD, Kmg90, Bhound89, Bbatsell, Damicatz, Striver, Thebogusman, Mangojuice, Sengkang, SCEhardt, El Suizo, Mb1000, Gillj, MarkusHagenlocher, Wayward, Moleskiner, Trewornan, Mgreenwald, Graham87, Cuvtixo, Magister Mathematicae, Ilya, BD2412, Liqk, Chun-hian, David Levy, HowardW, Kbdank71, FreplySpang, Haikupoet, RxS, Mendaliv, Jcmo, Canderson7, Sjö, Sjakkalle, Rjwilmsi, Tykell, Coemgenus, Tarnas, Joemelville, XP1, TruthCrusader, JHMM13, Tangotango, Salix alba, Tawker, Pabix, Quietust, Kazrak, Mikedelsol, ElKevbo, Brighterorange, Bhadani, Matt Deres, GregAsche, Sango123, Twerbrou, Yamamoto Ichiro, Leithp, Ehedaya, Wobble, Kako~enwiki, JeffAMcGee, Titoxd, Ian Pitchford, RobertG, SiGarb, Duomillia, Mishuletz, Musical Linguist, Doc glasgow, Latka, Pfctdayelise, Vandal B, Nivix, Chanting Fox, Isotope23, Hottentot, Kerowyn, Celestianpower, RexNL, Gurch, Verybigfish86, NoSeptember, Str1977, Brendan Moody, Bmicomp, Benanhalt, King of Hearts, Scimitar, Raymond Cruise, Jimig, Bornhj, Stoive, JesseGarrett, Gdrbot, Antiuser, Cactus.man, Digitalme, Gwernol, Eclipsed Moon, YurikBot, Wavelength, Chanlyn, TexasAndroid, Michaeladenner, Hawaiian717, JJLeahy, Eraserhead1, Deeptrivia, Huw Powell, RussBot, Woseph, Red Slash, Jtkiefer, Muchness, Jumbo Snails, Anonymous editor, Splash, Pigman, Bergsten, SpuriousQ, CanadianCaesar, Hydrargyrum, Stephenb, Gaius Cornelius, CambridgeBayWeather, Yyy, Wimt, Shanel, NawlinWiki, Shreshth91, Curtis Clark, Dysmorodrepanis~enwiki, Wiki alf, Chick Bowen, Bloodofox, Badagnani, Jaxl, RazorICE, Shaun F, Shafik23, Krea, Seegoon, Nick, Robdurbar, Zackus, Dhollm, Hotfudge~enwiki, Rmky87, Saberwyn, Misza13, Zwobot, Bucketsofg, Syrthiss, Aaron Schulz, Samir, Pablomartinez, DeadEyeArrow, Brisvegas, Nlu, Nick123, Wknight94, Pejhman, Dan Harkless, FF2010, Zello, Zzuuzz, Epiq, StuRat, Chase me ladies, I'm the Cavalry, Gyuen, Theda, Closedmouth, Jwissick, Sotakeit, Mr Gayle, Fang Aili, Pb30, Josh3580, Dspradau, Sean Whitton, GraemeL, Aeon1006, JoanneB, Alias Flood, Smileyface11945, Guillom, HereToHelp, JLaTondre, Jaranda, AGToth, Bluezy, Kungfuadam, Junglecat, RG2, NeilN, Kingboyk, Funkendub, Tyomitch, KNHaw, SkerHawx, DVD R W, Tobyk777, TravisTX, Veinor, Yakudza, Myrabella, SmackBot, Burtonpe, YellowMonkey, Victor M. Vicente Selvas, TomGreen, Aido2002, Moeron, Mangoe, Bobet, Malkinann, Maelwys, KnowledgeOfSelf, Melchoir, Sanjay ach, AFBorchert, McGeddon, Pgk, CyclePat, Victorllee, Jacek Kendysz, Zzzzz, ScaldingHotSoup, Anastrophe, Delldot, Frymaster, Ilikeeatingwaffles, Wbfl, Fnfd, Kintetsubuffalo, Kslays, Bobo the hobo, Wittylama, Niro5, Srnec, Bugs5382, Xaosflux, Gilliam, Ohnoitsjamie,

Hmains, Betacommand, Oscarthecat, Skizzik, Carl.bunderson, ERcheck, Haunteo, JAn Dudík, Planetthoughtful, Anwar saadat, Tyciol, Saros136, Bluebot, Spilla, Geneb1955, Rkitko, Quinsareth, Persian Poet Gal, Thumperward, Christopher denman, Melburnian, SchfiftyThree, Wtroopwept, Uthbrian, Nataraja87, BPBox, Ikiroid, Rolypolyman, Kungming2, Erfemf, Blagov, TKY, Rlevse, Gracenotes, Dpalma01~enwiki, Diyako, Audriusa, Zsinj, Pt1234, Burstroc, Can't sleep, clown will eat me, Emrrans, Ajaxkroon, Shalom Yechiel, Cashew, Vanished User 0001, Snowmanradio, Geoffrey Gibson, AMK152, Yidisheryid, Xiner, Rrburke, TKD, VMS Mosaic, GregoryBrown, Flubbit, Kcordina, Wine Guy, Thrane, Abrahami, Pepsidrinka, Aldaron, Answerthis, Ghost Op, Reid A., BostonMA, Adamcobb, Cybercobra, Cloud02, Bigturtle, Nakon, RJN, Nick125, Cordless Larry, Crab~enwiki, Smokefoot, Jeffasinger, Mwtoews, KeithB, Kotjze, Jwh, Alan rickman freak, Zeamays, Bidabadi~enwiki, Risker, Thistheman, Pilotguy, Rossp, Wossi, Ohconfucius, Dane Sorensen, Nishkid64, Severisth, Rory096, Rklawton, Srikeit, Dbtfz, Molerat, Kuru, John, Carnby, Zaphraud, T3hZ10n, Ocee, Silk-Tork, CatastrophicToad~enwiki, Sir Nicholas de Mimsy-Porpington, Shlomke, Edwy, Chodorkovskiy, A-moll9, Mgiganteus1, Shazdor, Number36, Syferus, Mr. Lefty, PseudoSudo, Ckatz, RandomCritic, A. Parrot, Slakr, Mr Stephen, Kyoko, Avedomni, Childzy, Emurph, Stizz, SandyGeorgia, Tuspm, Ryulong, EdC~enwiki, Condem, EEPROM Eagle, Jose77, Cerealkiller13, Keitei, Ferball415, Kavaiyan, Hetar, ISD, BananaFiend, Shawn D., Iridescent, AsadRahman, Dakart, Clarityfiend, Thepearl, Lakers, J Di, Twas Now, Octane, E44~enwiki, WonderbreadUSA, Ewulp, Burndownthedisco, Az1568, Anger22, Asethapart, Tawkerbot2, Dlohcierekim, G-W, Fredman007, Aristotle1990, Ianistheman33, Orangutan, Eastlaw, ERAGON, Falcon9xr, JForget, Linuxerist, Aznspazboi, AngelAeris, Deon, Zarex, Scohoust, Iced Kola, WildWeathel, Picaroon, RedRollerskate, RZiggy03, Nunquam Dormio, Runningonbrains, CWY2190, R9tgokunks, Nadyes, GHe, Green caterpillar, Epistemophiliac, Baskaufs, Raz1el, Tahirs, MarsRover, Logical2u, Avillia, Neelix, Beautifulppg, Monachima505, Zephlyn, Funnyfarmofdoom, TJDay, Maxxicum, Peteturtle, Cydebot, Peripitus, Citations, Righttovanish1, MC10, Vanished user vjhsduheuiui4t5hjri, Goldfritha, Gogo Dodo, Jkokavec, Bellerophon5685, Bridgecross, BlueAg09, JFreeman, Llort, Adolphus79, DocDee, Palmiped, RabidWolf, Daniel J. Leivick, Tkynerd, Karafias, Cheesy dude, Tawkerbot4, Shirulashem, Rcj442, Christian75, Roberta F., DumbBOT, Narayanese, Sigo, Kozuch, Njan, Omicronpersei8, Ebraminio, Dyanega, UberScienceNerd, PamD, Tewapack, Casliber, Rosser1954, EvocativeIntrigue, CieloEstrellado, Malleus Fatuorum, Finalfour4, Poorleno, Epbr123, CutmanSteel, Aaronforjesus, Mysteryglow, PerfectStorm, Simongregson, Headbomb, Appppp, Deep Shadow, Simeon H, ChrisX91, Dtgriscom, Marek69, Nutter butters, Crzycheetah, Tapir Terrific, Ufwuct, Garymason, Tellyaddict, Merkurix, Cool Blue, Arthur Ellis, GregMinton, StudentJCase, Farrtj, DRyan, EdJohnston, Pcbene, Scottandrewhutchins, Xycl0ne, AlefZet, Escarbot, Nappateemu, Rees11, Gossamers, AntiVandalBot, Majorly, Luna Santin, Seaphoto, 1122, Sfrankel05, Yomangani, Fru1tbat, Rhysko, Tchoutoye, Jj137, Pro crast in a tor, Eugene Inglebretsen, Scepia, Gaj2329, SadanYagci, LibLord, Yellowdesk, Bevsta, Storkk, The man stephen, Mhagerman, JAnDbot, Xhienne, Dan D. Ric, Husond, Barek, MER-C, Kedi the tramp, Hydro, Wootery, Quentar~enwiki, Dalek Cab, H3llbringer, Buck49, Dcooper, Wallstreet1986, Professor London, Krasanen, Bob O'FLYNN, Hut 8.5, Greensburger, Professor Penispump, Steenjager, TheEditrix2, Felson, SiobhanHansa, GradeZeroEradicator, Acroterion, Shadowcelibi, Juggernaut0102, Bongwarrior, VoABot II, Efb91, AuburnPilot, DC1691316, Cubschitown29, Faizhaider, Ling.Nut, Rivertorch, Rami R, Dep. Garcia, Steven Walling, Nyttend, Jatkins, TheOtherBob, Dalent, SparrowsWing, SwiftBot, Avicennasis, Jvhertum, Gr1st, Theroadislong, Animum, Bryson430, Taamu, Wrad, Allstarecho, Tswsl1989, Dck7777, SnapSnap, Lpo0, Mfloryan, PaiBak, 3idiot, Fictional tool, DerHexer, Wdflake, Matt.smart, Esanchez7587, Lenticel, Khalid Mahmood, WLU, TheRanger, Patstuart, Rorkster2, Seba5618, AliaGemma, Dsavi.x4, Smaxson, Tennispro1188, FisherQueen, Majortone, Georgiabelltaylor, Jerem43, Nickboey22305, HuntClubJoe, Hdt83, MartinBot, FlieGerFaUstMe262, Mmoneypenny, Tic tam, Rettetast, Keith D, Averross, Aeonoris, CommonsDelinker, Irisheagle, Bobstupid123, Nono64, Hairchrm, Batman123456, Smokizzy, LedgendGamer, Freudiannslipp, The Holy Bible, Wlodzimierz, Huzzlet the bot, J.delanoy, Brastein, Trusilver, EscapingLife, Poohead4411, Deepakpurang, Uncle Dick, Miller101, Itsbigt, Mithman, JDogg1329, Extransit, Lalabanjoheadcom, Merlot70, Lshanahaba, Nickhirst, Acalamari, Sahil lavingia, XSBDX, Alma1227, Ajmint, Shootmeagainandagain, Puss183, Cmsull02, Bot-Schafter, Big Maccy, McSly, Thomas Larsen, Benjamint444, Grosscha, Mikael Häggström, L'Aquatique, Troyvarsity, Diane Tribble, Renegade Replicant, AntiSpamBot, Plasticup, Szzuk, NewEnglandYankee, SLPHB117, Serge925, SmilesALot, Keke316, SJP, Thesis4Eva, Hbijlmakers, Wissahickon, ThinkBlue, Student7, Swati Mridu, Nadiatalent, Bloober, Jtk13, Tyler128974, 2help, Europeanul, Plindenbaum, RB972, VentusIgnis, Hc5duke, Plots, U.S.A.U.S.A.U.S.A., Treisijs, Nitsud.efif, Ross Rulz, Jaymindesai, Xmattiex, LastChanceToBe, IceDragon64, JavierMC, Million Moments, Acdcacdc, Steel1943, Idioma-bot, Cmurphy10, Down to Heart, Spencerwalford, Lights, G. Völcker, X!, Werdwerd123, MBlue2020, UnicornTapestry, Deor, VolkovBot, Shreadhead, TreasuryTag, ABF, JazzD, Chango369w, Majoreditor, Esrdf, Animan922, Reeceyboy12, Philip Trueman, Somanypeople, TXiKiBoT, Serg!o, Theriac, Guaminite, Link, Vipinhari, Miranda, Dchall1, Lssdcs, Fizzle980, Homerdudeasd, Charlesdrakew, Qxz, Someguy1221, Vanished user ikijeirw34iuaeolaseriffic, Corvus cornix, Mistman123, Fortethefourthversion, ^demonBot2, Plus-media, Cogburnd02, Andrewrost3241981, BotKung, Guest9999, Olive john, Latulla, Blacksmith, Cdextra, Photo1B, Trixos, Maxim, ACEOREVIVED, SlipperyHippo, Pwnagelalala, BALLIN121956, NodnarbLlad, CRFWNY, Kaldso1, Madhero88, Anjuschka~enwiki, Andy Dingley, Viktor-viking, DJFishlips, Synthebot, Cheesebreadsticks95, Derrick777, Jaguarlaser, Falcon8765, @pple, Isimbot, Lytel, Seresin, ObjectivismLover, Watermelon-Potion, Omar abdallah, Minimel66, Agüeybaná, Mariobrossamash, Brianga, Showers, Nagy, Stefanhanoi, Red58bill, Xxbananaxx, Ellomate, SylviaStanley, Wiiunite, Thw1309, Botev, SMC89, SieBot, Colleenthegreat, Calliopejen1, Jmwwiki, 4wajzkd02, Graham Beards, Sicksymo, Bikel, Meldor, Da Joe, Dawn Bard, Caltas, Bielle, New England, Rawrthness, Xymmax, RJaguar3, Bean51, Cb77305, Letter 7, Ein alb bin ich, Garrett gagne, Chocolatecornflakes, Coletaylor6595, Purbo T, Owl 2, Arda Xi, Interchange88, Manville, Notnihekaj, HimMan, Aillema, Toddst1, Hemansx, JD554, Big ossan, JSpung, Yoursaviorgamer, Eballnik, Ss11311086, Oxymoron83, Baseball Bugs, Kamell305, SeriousKarma, Lightmouse, Techman224, Sunrise, Nancy, Trueromeo6, Maelgwnbot, Anakin101, Jansta, Spartan-James, Dannichau, Jaan, Realm of Shadows, Maralia, Batapp, Bowei Huang 2, Thedogsballads, WikiLaurent, Metsdudes4eva, Nn123645, Superbeecat, Nickomargolies, Pinkadelica, Pauljoffe, Abe the conconut, Cwtripp7, TSRL, Lordmaiku, Prof. Campbell, Faithlessthewonderboy, Atif.t2, Chris D Heath, ClueBot, Bond81895, Rumping, Kriser269, Palookah, Shindou123, Cellphonerubb3rband, The Thing That Should Not Be, Jamalhamou, Rjd0060, Elmao, TychaBrahe, Captin Stan, Metiscus, Desoto10, Parkjunwung, Venusdoom, WDavis1911, Michael.Urban, Charlesbridge, Kathleen.wright5, DanielDeibler, Hafspajen, Aznsavge, John Orson, Aoaaoa, Alwfonz, NovaDog, Insane Fury, Peanut4, Flyeater16, RafaAzevedo, Piledhigheranddeeper, Aledbatey, Gordon Ecker, Aua, Braydonf, NickM 29, Vegitoes, Alexbot, Jusdafax, Grant33, Andy pyro, Supasnadwich, Roflcopterr, ATER1, Floydrox, INazi, Knowledgemaster585, Winston365, Jsmaine22, Ghostrider, Key of Now, Pearrari, Blackhawk440, Pricey03, Singhalawap, Revotfel, Dekisugi, Romatt, Obe12, Moopiepipi, The Red, BK4ME, Bigair46, Jackarank, Goblue05131, Rui Gabriel Correia, Piyush693, Dr.flippysaurus, Gopopopo, 24308143Z, JaneGrey, Bradymonty, Thingg, Rohare634, 101mhoshizaki, Camster360, Aitias, Crnorizec, Anoopan, ConjurusRex, Lukecrawley, ThreeWikiteers, Massvideogamer, Versus22, Dana boomer, IJA, MelonBot, Bparker1000, SoxBot III, Lordlorien921, Wnt, The Zig, DumZiBoT, Ogdens, Lameducky987, Tex duped, BendersGame, Mynameisalanremenapp, Against the current, XLinkBot, ItsLassieTime, Nickham, Smshbrosfreak247, Dragon girl911, Чрьный человек, Imagine Reason, Wikiuser100, Mikaile676, Skarebo, NellieBly, Kaiwhakahaere, NHJG, ZooFari, Yes.aravind, Gggh, Deineka, Addbot, Ocrasaroon, Manuel Trujillo Berges, Itwouldhavefit, DOI bot, Beamathan, Jojhutton, Landon1980, Breutigam, Kycoffill, Carl323, Mary-tats, Kartman1751, Valejo10005, DougsTech, Chocogurl104, Urahdog4, Ronhjones, Fieldday-sunday, Teh win, Scientus, CanadianLinuxUser, MrOllie, SoSaysChappy, CarsracBot, Spittlespat, Debresser, Mon-

keyman421, Tassedethe, Tide rolls, Pietrow, Luckas Blade, Sionnach1, Loupeter, Zorrobot, David0811, Frehley, Luckas-bot, Yobot, Dsx2, Jadicuss, Nghtwlkr, Legobot II, Newportm, Electronsoup, Freikorp, PMLawrence, KamikazeBot, Backtothemacman32, Vrinan, MacTire02, AnomieBOT, Arjun G. Menon, IRP, Galoubet, Dwayne, Cottonapple4, AdjustShift, Kingpin13, Photographerguy, Ulric1313, Krause01, Materialscientist, Likeyah64, Ganixaba, The High Fin Sperm Whale, Citation bot, Pomeapplepome, Kalamkaar, Zachman2594z, Whoopipie, Tristantech, RevelationDirect, Bob Burkhardt, Maxis ftw, Killerrabbitsontheloose, BlurTento, Quebec99, LilHelpa, Gsmgm, Riswald, Xqbot, Agather, The Banner, Gigemag76, 4twenty42o, What!?Why?Who?, Jeffrey Mall, ChildofMidnight, Gensanders, D2earth, TudorTulok, Intelligentlove, Champlax, Dim Grits, Mynameinc, Egausmcdon, Abce2, Toprewolf Tepmirk, АлександрВв, Shirik, Zefr, Amaury, Brutaldeluxe, GhalyBot, Hb353, Dylan Hunt, PM800, Kkhustler, Celuici, Yamachewyow, Legobot III, Themeparkgc, Niz1vir, Schwei2, Paine Ellsworth, Hypertime179, Wikipe-tan, Sky Attacker, Alarics, Ratpole, Alxeedo, Sammyq9, HJ Mitchell, Fofo23, Lacrosse animal, Me1443, Vcbee101, TripleU, Kwiki, Xhaoz, OgreBot, Citation bot 1, Javert, Krish Dulal, Colin the beater beattie, Ilovejoe13, Ntse, YourBoba, Joshthemackid, Mcslurp, Selahbaby, DrilBot, Connerandtom, Mtlll999, Jakejack, Galloramenu, Trutherman, Haitherehaithere, Pretzel1000, 5yd23, Mzekezeke, Ikillufast, Hadabadeh, Gafax, HRoestBot, Edderso, Abductive, English06, 95j, Jaunade, A8UDI, BRUTE, Btilm, HowardJWilk, Tahir mq, Qzqzqzqz, Lrc4life, Wearegs, Billcoops, Weareamaz, MJ, Meaghan, DoYouKnow333, Kkkkkkl, Diemikeydie, Davideeeee, Kibi78704, EmzzxxxCookie, Jigsaw12300, December21st2012Freak, Silurian King, Richardg09, AGiorgio08, Kinojroy, Therealbrendan, 06yalexander, Rhupps, The Page Ruiners Wow Omg, Soccerisawesome, Leasnam, Lightlowemon, Orenburg1, FoxBot, Trappist the monk, Beaukarpo, A.Beaz, Mejkravitz, ManfromButtonwillow, Ndkartik, Theo10011, Makki98, Tbhotch, Puppyspencer, Carlostitz, Cluemaster25452, Owensteer73, The Utahraptor, NerdyScienceDude, Bowei Huang, DASHBot, Esoglou, EmausBot, Nima1024, WikitanvirBot, Carlotm, Immunize, AmericanLeMans, Lucien504, Evgenior, ScottyBerg, GoingBatty, Playmobilonhishorse, Ebe123, AndrewJMT, Wikipelli, Djembayz, Evanh2008, ZéroBot, Ida Shaw, Bongoramsey, Fæ, Maxviwe, Bollyjeff, Jeanpetr, Joshfinnie, RaymondSutanto, KuduIO, H3llBot, Loginloginlogin, SporkBot, Erianna, AutoGeek, Ocean Shores, Coasterlover1994, L Kensington, Manliestapple, Hardy141, Theinfamousblue, Osisbs, Palosirkka, Adam9476, Donner60, Sirduke13, ChuispastonBot, Drive4life, Neil P. Quinn, Ksmit139, Isthisuseful, ClueBot NG, Michaelmas1957, PaleCloudedWhite, Movses-bot, Loginnigol, Dabuddy, Kylesnage, GlassLadyBug, Danim, Theopolisme, Helpful Pixie Bot, ?oygul, 9tmaxr, Wbm1058, Plantdrew, Beaumont877, Salamibedone3, Northamerica1000, Argo752, Imgaril, Abject Normality, United7471, Frze, Furkaocean, Jahnavisatyan, Compfreak7, OttawaAC, Nickzlapeor, Zhang.jiahe, Shubhee, NotWith, Granateple, Risingstar12, Tamara Ustinova, Maurice Flesier, Naslambo78, Itsthebozz, TamizhNesh, Gibbja, Sleepywolf8, Lucalex, Ihateicairns, Fuzzywuzzybear92, Cheesepizzaface, Nitrobutane, MeanMotherJr, BattyBot, Darorcilmir, Fastcatz, Maxronnersjo, Lewishousden, Khazar2, Kulbushan, Hridith Sudev Nambiar, BrightStarSky, Dexbot, Sminthopsis84, Hmainsbot1, Luddovich, Qskb, UsefulWikipedia, Numbermaniac, Frosty, Theopolisme (Public), Sumanpao, FallingGravity, Kuplet, Sonĝanto, Jmsmartins, JoeMeas, Shivajivarma, Maxibon24, ElHef, Njakaisheila, AcidSnow, Lufthansa23, Kind Tennis Fan, Rekowo, Gravuritas, Vbernau, DarkRoseThorn, Monkbot, Trackteur, Tomofakind, Mruberkins, TSlag32, Ilikefunny, Riversid, EoRdE6, TeaLover1996, WikiGuiGuy, Kyeostby, Applezap4, SheillahShadia, JrolesGuy and Anonymous: 1326

- **Alnus glutinosa** *Source:* http://en.wikipedia.org/wiki/Alnus_glutinosa?oldid=662743039 *Contributors:* Wetman, Pigsonthewing, UtherSRG, Alan Liefting, MPF, Obli, Auximines, JoJan, DanielCD, Xezbeth, Hapsiainen, Circeus, Jumbuck, Etxrge, AnnaP, SteinbDJ, Gene Nygaard, Stemonitis, Rocastelo, JIP, Rjwilmsi, Coemgenus, Ricardo Carneiro Pires, FlaBot, Eubot, AdnanSa, Gdrbot, YurikBot, RussBot, Dysmorodrepanis~enwiki, Bloodofox, Ormanbotanigi, Lt-wiki-bot, Wsiegmund, SmackBot, Hmains, Chris the speller, Rkitko, Gruzd, Bruce Marlin, Tlusťa, Flyguy649, Dcruz01, Titus III, Mr Stephen, Rosser1954, Thijs!bot, JAnDbot, Krasanen, WolfmanSF, Hekerui, Peter coxhead, R'n'B, Nono64, J Dezman, Chiswick Chap, Idioma-bot, VolkovBot, TXiKiBoT, Maksdo, Fraxinus Croat, Giancarlodessi, Jaguarlaser, SieBot, BotMultichill, ClueBot, Hafspajen, Alexbot, BodhisattvaBot, MystBot, ElMeBot, Addbot, Ka Faraq Gatri, Peti610botH, First Light, Zorrobot, Luckas-bot, Yobot, TaBOT-zerem, AnomieBOT, ArthurBot, Xqbot, Brutaldeluxe, FrescoBot, Archaeodontosaurus, AstaBOTh15, RedBot, RjwilmsiBot, EmausBot, Look2See1, ZéroBot, Peppigue, Sainsf, Rcsprinter123, ChuispastonBot, Cwmhiraeth, Movses-bot, Justincheng12345-bot, Darorcilmir, Dexbot, Lemnaminor, Impuls666666, KasparBot and Anonymous: 24

- **Malus sylvestris** *Source:* http://en.wikipedia.org/wiki/Malus_sylvestris?oldid=656319604 *Contributors:* MPF, Roo72, Stemonitis, Marudubshinki, Eubot, Jmorgan, Dysmorodrepanis~enwiki, IceCreamAntisocial, Junyi, SmackBot, Pmaas, Hmains, Rkitko, Esculapio, Kevmin, EPO, Editor at Large, Thijs!bot, Storkk, Krasanen, Bumper12, Nadiatalent, IceDragon64, Idioma-bot, VolkovBot, Jmrowland, AlleborgoBot, SieBot, Gerakibot, Da Joe, Kentynet, ClueBot, DragonBot, Bagworm, Alexbot, Reporein, Wasrts, Addbot, Cuaxdon, LaaknorBot, SamatBot, Luckas-bot, Amirobot, AnomieBOT, RadioBroadcast, MauritsBot, GrouchoBot, SassoBot, Correnos, D'ohBot, RedBot, EmausBot, Erianna, Rxguy, Fm59, Wehha, Loc-brief, Justincheng12345-bot, Darorcilmir, Impuls666666, Riversid and Anonymous: 5

- **Fraxinus** *Source:* http://en.wikipedia.org/wiki/Fraxinus?oldid=665979773 *Contributors:* CYD, Andre Engels, William Avery, Caltrop, Zoe, Jaknouse, Quercusrobur, Henriette~enwiki, Breakpoint, Tannin, Ixfd64, (, Ahoerstemeier, Stan Shebs, TUF-KAT, Александър, Andres, Richard Avery, Peregrine, Dino, Marshman, Imc, Wetman, Eugene van der Pijll, Donarreiskoffer, Robbot, Kristof vt, RossA, UtherSRG, Ludraman, DocWatson42, MPF, Achurch, Mooquackwooftweetmeow, Yath, JoJan, DanielZM, Trevor MacInnis, DanielCD, Chris j wood, Murtasa, Azikala, Swid, CanisRufus, Kwamikagami, Bobo192, Circeus, Hesperian, Nsaa, Etxrge, Rwendland, Djlayton4, Geographer, Kazvorpal, Jackhynes, Mel Etitis, Woohookitty, Richard Barlow, Pixeltoo, Torqueing, GregorB, TheAlphaWolf, Mandarax, Graham87, BD2412, Mendaliv, Rjwilmsi, Astatine, DDerby, Eubot, Hannu83, Gdrbot, Bgwhite, WriterHound, ThunderGryph, Wavelength, RobotE, Curtis Clark, Dysmorodrepanis~enwiki, Bloodofox, Icelight, TDogg310, Hv, Lockesdonkey, Zzuuzz, Anclation~enwiki, Katieh5584, Mmcannis, DVD R W, SmackBot, Maxima m, RedSpruce, Yamaguchi 先生, Rearden Metal, EncMstr, Melburnian, Jerome Charles Potts, Can't sleep, clown will eat me, JRPG, Addshore, ProtocolOH, Cookie90, MrDarwin, Bjankuloski06en~enwiki, Neddyseagoon, Ryulong, Dabean, BranStark, HisSpaceResearch, LadyofShalott, CmdrObot, R.christie, Pontus Lindengren, Casliber, Rosser1954, Epbr123, Osborne, DSLeB, Jd2718, Ufwuct, Nick Number, ThomasPusch, AntiVandalBot, Nipisiquit, Storkk, JAnDbot, Deflective, MER-C, Krasanen, Cynwolfe, Mr. G. Williams, Animum, Mtd2006, Esanchez7587, MartinBot, Wlodzimierz, J.delanoy, Maproom, Grmanners, Gurchzilla, Idioma-bot, VolkovBot, Safemariner, Hypnopomp, Psyche825, Seb az86556, Maksdo, P M Yonge, ChillDeity, Brianga, Bfpage, Fabullus, Triwbe, Oda Mari, Thesithwithashotgunshell, Edsuit, Smf5000, TSRL, ClueBot, Kotniski, Dreamback1116, Odin13013, Water pepper, LarryMorseDCOhio, Ouedbirdwatcher, Maniago, Noosentaal, Bogbumper, Saebjorn, 7, NERIC-Security, Slayerteez, Mifter, Addbot, Manuel Trujillo Berges, Holt, Cuaxdon, Chip8chips, Proxima Centauri, Campolongo, Karduelis, Abrajab, Tide rolls, Lightbot, Dietzel, Legobot, Luckas-bot, Yobot, DemocraticLuntz, Frankenpuppy, ArthurBot, DirlBot, Xqbot, ShoreCrab, Tamadrums, TinucherianBot II, Twilight1-4, Anna Frodesiak, Emerson27, RibotBOT, Brutaldeluxe, Beefy bebster, Lecheminlu, Craig Pemberton, Citation bot 1, Jauhienij, Seanwinstanley, TobeBot, ZhBot, TheLongTone, ThinkEnemies, RjwilmsiBot, TjBot, DEagleBot, Rwood128, EmausBot, אריה ה., Ivrib, Architect7, عم روبن لل ثوم, ClueBot NG, ClaretAsh, PaleCloudedWhite, Primergrey, Widr, Helpful Pixie Bot, Bcb1800, Pasicles, Jjtimbrell, Vaytex, Mogism, Nomen ambiguum, BurritoBazooka, Hazelares, SarahRMadden, Joseph Laferriere, Monkbot, Malerisch, Evawww, Damienhinsinger and Anonymous: 167

- **Fraxinus excelsior** *Source:* http://en.wikipedia.org/wiki/Fraxinus_excelsior?oldid=662743042 *Contributors:* Kpjas, Zundark, Andre

Engels, Tannin, Notheruser, Richard Avery, Tjunier, Imc, Fernkes, Donarreiskoffer, Ashley Y, MPF, Svennex, Auximines, CryptoDerk, JoJan, Pinnerup, Silly Dan, Bobo192, Hesperian, Etxrge, Rwendland, Dave.Dunford, RyanGerbil10, Mindstream, Stemonitis, Firsfron, Woohookitty, Richard Barlow, Jean-Pol Grandmont, Noselasd, BD2412, Hjb26, Eubot, Lemmikkipuu, Jaraalbe, Gdrbot, Bgwhite, Dysmorodrepanis~enwiki, TDogg310, Orcaborealis, SmackBot, Johnrcrellin, EncycloPetey, Ohnoitsjamie, Hmains, Hibernian, Nakon, Peter Horn, Dabean, Kaarel, Gil Gamesh, Disambiguator, CmdrObot, Lamiot, Wriggles1, Flynnbar, Damianrafferty, Rosser1954, PKT, Thijs!bot, Iulius, Nipisiquit, Storkk, JAnDbot, Plantsurfer, Magioladitis, Wlodzimierz, Gurchzilla, IceDragon64, GrahamHardy, Idioma-bot, VolkovBot, Safemariner, TXiKiBoT, Karmos, Jaguarlaser, SieBot, Hamiltondaniel, Tatterfly, BOTarate, Corcs999, DumZiBoT, Coccionos, Addbot, Mortense, CarsracBot, AndersBot, Chzz, Dietzel, Luckas-bot, Yobot, Legobot II, El Grafo, Elegend, DAFMM, MauritsBot, Xqbot, TechBot, Almabot, GrouchoBot, SassoBot, Brutaldeluxe, Seanwinstanley, Orenburg1, FoxBot, TheLongTone, DEagleBot, EmausBot, WikitanvirBot, Look2See1, HiW-Bot, Lobsterthermidor, ZéroBot, Matthewcgirling, Rcsprinter123, Botanica Arduenna, عمرو بن لثوم, ClueBot NG, Bat454, PaleCloudedWhite, Pawprint52, Helpful Pixie Bot, NotWith, Pasicles, ChrisGualtieri, Dexbot, Hair, TerryRowell, Leopardragon, Hazelares, Nightphoenix90, Joseph Laferriere, Monkbot, Impuls666666, KasparBot and Anonymous: 45

- **Birch** *Source:* http://en.wikipedia.org/wiki/Birch?oldid=665536651 *Contributors:* Magnus Manske, JeLuF, William Avery, Azhyd, Jaknouse, Hephaestos, Quercusrobur, Moravice, TeunSpaans, Liftarn, Ixfd64, (, Torge, Egil, Jadepearl, Andres, Palfrey, Hike395, Imc, Grendelkhan, SEWilco, Topbanana, Shafei, AlexPlank, Robbot, Globe199, UtherSRG, Alan Liefting, DocWatson42, MPF, Keith Edkins, Knutux, Gzuckier, Antandrus, Ex ottoyuhr, JoJan, Rdsmith4, DanielZM, Deirdre~enwiki, Rich Farmbrough, Guanabot, Cacycle, YUL89YYZ, Murtasa, Dbachmann, Kwamikagami, Bobo192, Circeus, Robotje, Olve Utne, Hesperian, HasharBot~enwiki, Jumbuck, Alansohn, Velella, Fledgeling, Guthrie, Ghirlandajo, Kazvorpal, Luigizanasi, Brookie, SteveHFish, Stemonitis, Woohookitty, Richard Barlow, EnSamulili, Kelisi, Schzmo, BD2412, Bubba73, Czalex, The wub, Matt Deres, Mahlum~enwiki, FlaBot, Eubot, RobertG, Gurch, Hannu83, Chobot, DaGizza, DVdm, Gdrbot, Ahpook, YurikBot, Wavelength, RmM, Jon Peli Oleaga, RadioFan, Stephenb, Shaddack, Rsrikanth05, NawlinWiki, Dysmorodrepanis~enwiki, Wwilly, Janke, Bloodofox, Badagnani, Nick, Retired username, Mkill, DeadEyeArrow, Bota47, Asarelah, Mareklug, Wknight94, Tigershrike, Phgao, Theda, Thomas Blomberg, Fastifex, Zvika, Biddlesby, SmackBot, KnowledgeOfSelf, McGeddon, EncycloPetey, Eskimbot, Edgar181, Mikko-Petteri, Gilliam, Rkitko, Jprg1966, Berton, SchfiftyThree, Gruzd, ChristopherM, Langbein Rise, Can't sleep, clown will eat me, Jefffire, MeekSaffron, Khoikhoi, NaySay, Doodle77, Bejnar, Ohconfucius, Jomegat, SashatoBot, Potosino, Microchip08, Žiga, J 1982, Jefe619, JoshuaZ, Nighthawknz, Bjankuloski06en~enwiki, IronGargoyle, Pennyforth, Physis, Langhorner, Boomshadow, Peter Horn, MTSbot~enwiki, Newone, Bajamircea, Tig528, Ü, George100, JForget, CWY2190, Phanu9000, NickW557, Richard Keatinge, Nilfanion, Cydebot, Gogo Dodo, Bridgecross, Dreadpiratetif, Devanatha, Mon4, Shirulashem, JodyB, Zalgo, Rosser1954, Thijs!bot, Epbr123, NJPharris, Chickenflicker, Sobreira, Neil916, X., RoboServien, Escarbot, Hmrox, AntiVandalBot, Widefox, Opelio, Aelwyn, Storkk, Gökhan, Sluzzelin, JAnDbot, Deflective, Ekabhishek, Plantsurfer, Ericoides, ReignMan, VoABot II, Faizhaider, Think outside the box, Janadore, Ling.Nut, Bcatabas, PatialaPeg, Ksvaughan2, JaGa, Guitarspecs, FisherQueen, Notmyhandle, Gaidheal1, R'n'B, CommonsDelinker, Nono64, Lilac Soul, Dinkytown, J.delanoy, Pharaoh of the Wizards, Trusilver, Neiliyo, Victuallers, Psyclist112, Teol~enwiki, Larsenmax, MattDiClemente, STBotD, Bonadea, Squids and Chips, Idioma-bot, VolkovBot, Jehan60188, Philip Trueman, TXiKiBoT, Arnon Chaffin, Tatjak, Qxz, Corvus cornix, Werdtheogrecl, Seb az86556, Jigglypuffiscool, Maksdo, Vasantbarve, Malick78, Andy Dingley, Cantiorix, Brandonberti, SieBot, Birch21, Lost in a crowd, BotMultichill, Gerakibot, Kennkweder, CSPAClover, Flyer22, Nomadhacker, Hiddenfromview, JSpung, Dictionarydude1, Dmodderman, Juggler821, Dstlascaux, StaticGull, Choogler, Prof saxx, Lascorz, Atif.t2, Beeblebrox, ClueBot, Bob1960evens, The Thing That Should Not Be, Meekywiki, Drmies, DragonBot, No such user, Robert Skyhawk, Excirial, Alexbot, Verzannt, Slidinandridin06, Barbyr, Fastily, Rror, Wikiuser100, Robert of Ramsor, Addbot, Some jerk on the Internet, Ironholds, Leszek Jańczuk, Armankhan2008, Jim10701, CarsracBot, Alesiad123, AndersBot, Lucian Sunday, Rent A Troop, Numbo3-bot, Tide rolls, First Light, Bermicourt, Luckas-bot, Yobot, Luce nordica, Ptbotgourou, Fraggle81, TaBOT-zerem, Meotrangden, Worm That Turned, KamikazeBot, AnomieBOT, Piano non troppo, Ulric1313, Materialscientist, Hunnjazal, Billybobjhons, Citation bot, Tat1642, Fjames3, Zanderavia, Kakumaru, Oilybrash, Xqbot, Gigemag76, Anna Frodesiak, Make an account, Srich32977, Brout8, Ruy Pugliesi, GrouchoBot, Abce2, PCFleming05, RibotBOT, Marzedu, Hamamelis, SD5, FrescoBot, Riventree, Khalidmcs22, HJ Mitchell, Pinethicket, I dream of horses, Edderso, Jonkerz, Lotje, Mishae, Suffusion of Yellow, Tbhotch, Stroppolo, Alph Bot, Rwood128, DASHBot, EmausBot, Ghghnhhj, CaptRik, Solarra, Wikipelli, Hooligandisco, Ganesh Paudel, Ebrambot, H3llBot, Rcsprinter123, Mahass1979, L Kensington, Donner60, Orange Suede Sofa, ChuispastonBot, DASHBotAV, E. Fokker, ClueBot NG, CocuBot, MelbourneStar, Movses-bot, ShellBP, Joseph Biddulph, U2beal999, Cattlemans123, GlassLadyBug, Vibhijain, Igotaboner, Titodutta, Gob Lofa, BG19bot, Coolj2009, LittleMiss342, A2-33, Hghyux, Mediran, Torvalu4, Dexbot, Valdemarr, Andybard954, Jamesx12345, Flutide, Nalsenai, Telfordbuck, Epicgenius, Jiggly123, PhantomTech, HD259, Irisbox, George Parastatidis, Qubist, Baloney0007, Antrocent, Aleksander Kaasik, Joseph Laferriere, Monkbot, Vieque, Sopmoo, Asdklf;, Sarr Cat, Abe0821, Helloroboto, Its bri9090, That blonde chick and Anonymous: 351

- **Betula pendula** *Source:* http://en.wikipedia.org/wiki/Betula_pendula?oldid=655215243 *Contributors:* William Avery, Lquilter, Rossami, Andres, Imc, Pigsonthewing, UtherSRG, Angilbas, MPF, JoJan, Famartin, Shotwell, DanielCD, Rich Farmbrough, Murtasa, Xezbeth, Bobo192, Circeus, Longhair, Cavrdg, Jonathunder, A2Kafir, Jumbuck, Etxrge, Velella, Max rspct, Inge-Lyubov, Drbreznjev, Adrian.benko, Stemonitis, Richard Barlow, Jonnabuz, Rjwilmsi, Ricardo Carneiro Pires, KFP, Gdrbot, Scoo, Stephenb, Semperf, Miblo, Orcaborealis, SmackBot, Elktray, Mikko-Petteri, Ohnoitsjamie, Hmains, Chris the speller, Rkitko, Gruzd, Langbein Rise, Muadd, Mr Stephen, Kaarel, Ü, Rwst, Digigalos~enwiki, Danrok, Ambo100, Damianrafferty, Rosser1954, Malleus Fatuorum, Qwyrxian, Nick Number, AntiVandalBot, Emeraldcityserendipity, Storkk, JAnDbot, WANAX, Krasanen, Magioladitis, JamesBWatson, The Woman Who Sold The World, D.h, Petter Bøckman, Wlodzimierz, Chiswick Chap, Idioma-bot, VolkovBot, TXiKiBoT, Oreg~enwiki, Fraxinus Croat, Jaguarlaser, HelloMojo, Mehmet Karatay, SieBot, QualiaBot, SuzanneIAM, IvanTortuga, Andymar, TubularWorld, Bob1960evens, Tony Holkham, Leroyinc, Rror, Wikiuser100, Mahmudss, Tamtarm, Addbot, NjardarBot, KaiKemmann, Legobot, Luckas-bot, Yobot, Ptbotgourou, AnomieBOT, Materialscientist, Pitke, Xqbot, GrouchoBot, 山田晴通, Longrim, Lotje, Ripchip Bot, EmausBot, WikitanvirBot, Racerx11, TuHan-Bot, ZéroBot, Matthewcgirling, Hanjifi, Rcsprinter123, Nuvarande, ClueBot NG, Cwmhiraeth, PaleCloudedWhite, Movses-bot, Widr, Omar hoftun, Helpful Pixie Bot, BG19bot, Wasbeer, Darorcilmir, ChrisGualtieri, Chartonno, Mesuno, Impuls666666 and Anonymous: 43

- **Betula pubescens** *Source:* http://en.wikipedia.org/wiki/Betula_pubescens?oldid=647999465 *Contributors:* Rossami, Imc, Pigsonthewing, MPF, Karl-Henner, Hapsiainen, Circeus, Robotje, Etxrge, Luigizanasi, Stemonitis, Rocastelo, FlaBot, Eubot, Gdrbot, Dj Capricorn, WriterHound, Roboto de Ajvol, YurikBot, Eupator, Janke, Orcaborealis, SmackBot, Gladrim, RobotJcb, Elktray, Gilliam, Hmains, Rkitko, Salvor, Hibernian, Gruzd, Bruce Marlin, Ugur Basak Bot~enwiki, Kaarel, JoeBot, Markjoseph125, Rosser1954, Thijs!bot, AntiVandalBot, Res2216firestar, WANAX, Geniac, Lucyin, Soulbot, Drm310, Bogey97, STBotD, C. Foultz, VolkovBot, TXiKiBoT, Mazarin07, BotMultichill, QualiaBot, Rror, Addbot, Peti610botH, Flakinho, Oli8906, Luckas-bot, Yobot, AnomieBOT, Xqbot, Weepingraf, GrouchoBot, Berserkur, FrescoBot, Mishae, Innotata, EmausBot, WikitanvirBot, Look2See1, ZéroBot, Rcsprinter123, ChuispastonBot, BG19bot, AvocatoBot, Corn cheese, Semperscripto and Anonymous: 12

- **Beech** *Source:* http://en.wikipedia.org/wiki/Beech?oldid=665873529 *Contributors:* Tarquin, Jaknouse, Liftarn, Ixfd64, Nikola~enwiki, Looxix~enwiki, Muriel Gottrop~enwiki, Kingturtle, Lupinoid, Glenn, Tjunier, Marshman, Imc, SirJective, Thue, Geraki, RadicalBender, Pigsonthewing, Dmadeo, Alan Liefting, Matt Gies, MPF, Varlaam, Grant65, Pne, Yath, HorsePunchKid, DanielZM, Grunners, DanielCD, Rich Farmbrough, Murtasa, Mattisgoo, Art LaPella, Robotje, Smalljim, Elipongo, Cavrdg, Haham hanuka, Nsaa, Nickfraser, Ranveig, Mrzaius, 119, Moanzhu, Filladdar, Velella, Stemonitis, Richard Barlow, Cruccone, ^demon, Chochopk, TheAlphaWolf, Prashanthns, Slgrandson, T34, Kbdank71, Rjwilmsi, SMC, Mahlum~enwiki, Eubot, RexNL, Gdrbot, YurikBot, TexasAndroid, Waitak, Huw Powell, GeeJo, NawlinWiki, Dysmorodrepanis~enwiki, Raven4x4x, Sliggy, Snarius, DeadEyeArrow, IceCreamAntisocial, MaNeMeBasat, Orcaborealis, Greatal386, Fastifex, Mejor Los Indios, Tobyk777, SmackBot, Brya, DCDuring, Branlon, Gilliam, Rkitko, Baronnet, ChristopherM, PiMaster3, Kingdon, Lambiam, Karakal, Peterlewis, Ian Dalziel, Kurtle, Peter Horn, Senpaiottolo, Bajamircea, Courcelles, INkubusse, Neelix, Kazubon~enwiki, Leicester1, Rosser1954, Epbr123, Daa89563, TonyTheTiger, Ufwuct, Z10x, Natalie Erin, AntiVandalBot, Smartse, Nipisiquit, Storkk, JAnDbot, Plantsurfer, Ericoides, OhanaUnited, F64too, ReignMan, VoABot II, -Kerplunk-, Soulbot, Alejotheo~enwiki, Tjajkovskij, Catgut, Steevm, Logictheo, Preserved killick, Seba5618, Anaxial, Nips, J.delanoy, Trusilver, Svetovid, Acalamari, Eivindgh, Thriley, Ncmvocalist, Dskluz, Joshafina, Nadiatalent, Juliancolton, Gwen Gale, Idioma-bot, Ottershrew, LokiClock, Philip Trueman, TXiKiBoT, Steven J. Anderson, Jpeeling, ANtidEpreSSAnts, Falcon8765, GernotHir, Logan, Atubeileh, SieBot, Tnayin, Keilana, Luke999111, Sjwells53, Oxymoron83, Lightmouse, Wrpscott, Prof saxx, Froglivers, ClueBot, OlHen, Der Golem, Steamroller Assault, MartinFields, Mrsmothe, BotanyForAll, DumZiBoT, XLinkBot, Katpjotr, Wikiuser100, SilvonenBot, Jens od, Mifter, MarmadukePercy, MystBot, Leonini, Addbot, Cxz111, Manuel Trujillo Berges, C3r4, Holt, Artivist, Download, Nordisk varg, AndersBot, Erutuon, Luckas-bot, Yobot, Dlovas, Fraggle81, KamikazeBot, Jdeb901, AnomieBOT, Bsimmons666, Piano non troppo, Benjamín Jarčuška, LilHelpa, Xqbot, TinucherianBot II, Weepingraf, Capricorn42, Srich32977, J04n, GrouchoBot, Comedyboi, RibotBOT, Geopersona, Brutaldeluxe, Shadowjams, Eugene-elgato, Hamamelis, Taka76, Amplitude101, Intelligentsium, Pinethicket, Adlerbot, SW3 5DL, TobeBot, Firstclasspimp23, Minimac, TjBot, Monty carlo, EmausBot, Amtin, ZéroBot, Ida Shaw, KuduIO, H3llBot, Brandmeister, L Kensington, Teaktl17, ClueBot NG, This lousy T-shirt, Primergrey, ArboreallyProcessed, CopperSquare, Vibhijain, MauchoEagle, BG19bot, Murry1975, CarloMartinelli, Benzband, Boeing720, ChrisGualtieri, Pellizon2, Sminthopsis84, Mogism, Magnolia677, Sonĝanto, Jodosma, Tentinator, Rybec, Jin Zan, AMEbel, Monkbot, JCKillarney, Kelvin Santarita and Anonymous: 210
- **Fagus sylvatica** *Source:* http://en.wikipedia.org/wiki/Fagus_sylvatica?oldid=644419298 *Contributors:* Bryan Derksen, Heron, Ram-Man, Head, Wetman, PuzzletChung, Donarreiskoffer, Fredrik, Kristof vt, Altenmann, MPF, Henryhartley, Solipsist, Nathan Hamblen, Bobblewik, Edcolins, JoJan, Burschik, Joyous!, DanielCD, EugeneZelenko, Orlady, Circeus, Nk, 119, Ceyockey, Luigizanasi, RyanGerbil10, Stemonitis, Newnoise~enwiki, Velho, Ekem, Cruccone, ^demon, Jean-Pol Grandmont, T34, Eubot, Gdrbot, Jernejl, YurikBot, Huw Powell, RussBot, Zwobot, IceCreamAntisocial, Alpha 4615, Errabee, Orcaborealis, GrinBot~enwiki, Unyoyega, Ohnoitsjamie, Hmains, Rkitko, Jamidwyer, Hibernian, Carnby, Žiga, Paukrus, Courcelles, Nunquam Dormio, Casliber, Rosser1954, TonyTheTiger, Hugo.arg, MichaelMaggs, Dainis, AntiVandalBot, Lovibond, Smartse, JAnDbot, Krasanen, WolfmanSF, MartinBot, CommonsDelinker, Acalamari, Strimbu, Idioma-bot, Ottershrew, VolkovBot, ABF, TXiKiBoT, 0nlyth3truth, Jaguarlaser, Pruxo, Mywood, QualiaBot, Graminophile, PipepBot, OlHen, GoEThe, AssegaiAli, MalcolmGould, Panellet, XLinkBot, Addbot, Cuaxdon, Artivist, MrOllie, Numbo3-bot, Lightbot, Luckas-bot, Yobot, Sanyi4, Jdeb901, AnomieBOT, Callum1234, Obersachsebot, Xqbot, GrouchoBot, Shirik, RibotBOT, FrescoBot, LucienBOT, Archaeodontosaurus, Micromesistius, MastiBot, Jauhienij, Seanwinstanley, FoxBot, Orbicule, Woodexpert, EmausBot, WikitanvirBot, Look2See1, HarDNox, Matthewcgirling, Medeis, Rcsprinter123, AfroBrazilian, ClueBot NG, PaleCloudedWhite, Jean-Pol GRANDMONT, Vagobot, NotWith, Darorcilmir, YFdyh-bot, Dexbot, Sminthopsis84, Ercé, Semudobia, Gretamaben, Filedelinkerbot, Impuls666666, Coconutporkpie and Anonymous: 62
- **Buxus** *Source:* http://en.wikipedia.org/wiki/Buxus?oldid=636244313 *Contributors:* Ram-Man, Dominus, Ellywa, Stan Shebs, Docu, Magnus.de, Zoicon5, K1Bond007, Wetman, Robbot, Chris 73, Seglea, Pingveno, GerardM, MPF, Pethan, Picapica, DanielCD, Mani1, CanisRufus, Hesperian, HasharBot~enwiki, Alansohn, ESMtll, BD2412, Bubba73, Vuong Ngan Ha, Eubot, Gdrbot, YurikBot, Xoloz, RMcGuigan, Qwertzy2, David Pierce, Zwobot, Ms2ger, Vdegroot, Superp, Groyolo, Unyoyega, KVDP, Rkitko, Thumperward, Vietlong, Tamfang, Onorem, Gurdjieff, Bjankuloski06en~enwiki, Paul venter, CBM, Raz1el, Neelix, Smartse, Nipisiquit, JAnDbot, Ericoides, Krasanen, Pleather, Peter coxhead, Johnbod, Igno2, Malerin, Richard New Forest, Funandtrvl, Deor, Andy Dingley, QualiaBot, Arjayay, DumZiBoT, Virginia-American, MystBot, MatthewVanitas, Addbot, Karl gregory jones, Yobot, Jdeb901, Piano non troppo, Xufanc, Xqbot, Wcoole, GrouchoBot, FrescoBot, Plantmeister, Orenburg1, Jonkerz, EmausBot, WikitanvirBot, ZéroBot, ClueBot NG, Helpful Pixie Bot, Darorcilmir and Anonymous: 40
- **Buxus sempervirens** *Source:* http://en.wikipedia.org/wiki/Buxus_sempervirens?oldid=661490899 *Contributors:* Wetman, Robbot, MPF, Stemonitis, RM, Ricardo Carneiro Pires, Otets, Nimur, Gadget850, Asarelah, Sarefo, Rojomoke, Hmains, Rkitko, Smith609, RenamedUser2, Casliber, Nipisiquit, JAnDbot, Krasanen, Boston, Cadwaladr, Nadiatalent, Idioma-bot, TXiKiBoT, SieBot, Cymi, QualiaBot, Flyer22, ClueBot, Excirial, Virginia-American, MystBot, Addbot, Numbo3-bot, Zorrobot, Yobot, ArthurBot, Xqbot, Tomwsulcer, RibotBOT, SassoBot, Hamamelis, Archaeodontosaurus, FoxBot, Jonkerz, SamirNosteb, Ebrambot, ChuispastonBot, Jcaraballo, ClueBot NG, PaleCloudedWhite, Darorcilmir, LUKERAVI and Anonymous: 19
- **Cherry** *Source:* http://en.wikipedia.org/wiki/Cherry?oldid=666079660 *Contributors:* Magnus Manske, The Epopt, Timo Honkasalo, XJaM, JeLuF, PierreAbbat, Karen Johnson, William Avery, SimonP, Anthere, Ellmist, Quercusrobur, Infrogmation, Ixfd64, Ahoerstemeier, Ronz, Jpatokal, Darrell Greenwood, Александър, Julesd, Arteitle, Jengod, Fraise, Dmsar, Tb, Tpbradbury, Marshman, Imc, AndrewKepert, Nv8200pa, Rei, Karukera, Wetman, Eugene van der Pijll, AlexPlank, Robbot, Hankwang, Platypus~enwiki, Rfc1394, Academic Challenger, Gombe, Miles, Munion, David Gerard, Srtxg, DocWatson42, MPF, Ian Maxwell, Phil5329, Bkonrad, Chameleon, Comatose51, Utcursch, Antandrus, JoJan, Kaldari, Bumm13, Zfr, B.d.mills, Neutrality, Marcus2, Wyllium, Eyrian, Jiy, Discospinster, Rich Farmbrough, Hydrox, Kdammers, Vsmith, Bishonen, S.K., Zscout370, Joanjoc~enwiki, Surachit, Tom, Cacophony, Svdmolen, MPS, Bobo192, Fir0002, Smalljim, Nickburns, Haham hanuka, Methegreat, GK, Googuse, Ddddan, Alansohn, Buaidh, Bathrobe, Aza-Toth, Sligocki, Wtmitchell, RJII, Cheyinka, Bsadowski1, Nuno Tavares, Richard Barlow, PoccilScript, Eleassar777, Grika, Cbustapeck, Sengkang, Prashanthns, Pationl, GSlicer, Graham87, BD2412, Canderson7, Ketiltrout, Rjwilmsi, Astropithicus, Trlovejoy, Sango123, Yamamoto Ichiro, Doc glasgow, Margosbot~enwiki, Moroboshi, RexNL, BjKa, Mstroeck, Gdrbot, WriterHound, RussBot, WAvegetarian, Hede2000, Novastarj, Igo4U, SpuriousQ, Stephenb, Cryptic, NawlinWiki, Dysmorodrepanis~enwiki, Wiki alf, Astral, Dialectric, Grafen, Badagnani, Janet13, CaliforniaAliBaba, RUL3R, Panscient, JPMcGrath, Asarelah, Kewp, Trainra, IceCreamAntisocial, 21655, Lt-wiki-bot, Andrew Lancaster, Closedmouth, Astara, Ketsuekigata, JoanneB, Fram, Fourohfour, Argo Navis, Pinothyj, Junglecat, Carlosguitar, SmackBot, Unschool, Haza-w, Aflm, Melchoir, Pgk, C.Fred, KocjoBot~enwiki, TharkunColl, Alsandro, Alex earlier account, Yamaguchi 先生, Gilliam, Ohnoitsjamie, Skizzik, Hraefen, Rkitko, JDCMAN, Domthedude001, Melburnian, SchfiftyThree, Ikiroid, Colonies Chris, Gregoe86, Jameswilson, Bryndza, Can't sleep, clown will eat me, OrphanBot, NoahElhardt, Rrburke, MrRadioGuy, Cybercobra, Poopdeck, RolandR, All Hope, Strunke, Hmoul, Anlace, Vanished user 9i39j3, J 1982, SilkTork, Khono, Kevmin, Oagersnap, Shadowlynk, Edgar81, Jon186, Maksim L., Ace Class Shadow, Michael J Swassing, Hyperwiz, Peter Horn, Jose77, Onion-

mon, Daite, KJS77, Dontworry, Kahldris, Dannilion, Courcelles, TNBritRocker, Radiant chains, Tawkerbot2, Rikker04, Dia^, JForget, Helian~enwiki, Lmcelhiney, Dgw, Msavidge, Chmee2, FlyingToaster, Iokseng, Mushroom Pi, Maxim75, Hemlock Martinis, Beno18, Themightyquill, Pablogrb, Vanished user vjhsduheuiui4t5hjri, Clayoquot, Gogo Dodo, TicketMan, Anonymi, Alvesgaspar, Ergoiamtoo, Codetiger, Chrislk02, JodyB, Salzstar, PamD, Tytyga, Rosser1954, CieloEstrellado, VPliousnine, Epbr123, A Sniper, Hacky, Edal, MainlyTwelve, Massimo Macconi, Grayshi, CharlotteWebb, Nick Number, Escarbot, AntiVandalBot, BokicaK, Seaphoto, SummerPhD, Tangerines, LibLord, Bata 43, Gdo01, Paul144, Gökhan, MikeLynch, JAnDbot, Cdk, Barek, MER-C, Nthep, Reduxx, Andonic, Dcooper, Roleplayer, Hut 8.5, PhilKnight, TheEditrix2, LittleOldMe, Bencherlite, FaerieInGrey, Pedro, Bongwarrior, VoABot II, Lmbhull, Hasek is the best, JamesBWatson, Cgingold, User86654, Danoples, Taamu, CrimsonEye, Halogenated, DerHexer, JaGa, WLU, Urco, Jemijohn, Jerem43, MartinBot, STBot, Wowaconia, Jay Litman, TheEgyptian, Mschel, R'n'B, CommonsDelinker, Masebrock, Smokizzy, Wlodzimierz, J.delanoy, Richiekim, 5Q5, Athaenara, DD2K, TriviaKing, Lt. penguin, George415, Benjamint444, Janus Shadowsong, Kazu89, (jarbarf), NewEnglandYankee, Rosenknospe, 83d40m, Kraftlos, Nadiatalent, Cmichael, Juliancolton, Vanished user 39948282, Treisijs, Bonadea, HighKing, TheNewPhobia, JingaJenga, Chestertouristcom, CardinalDan, Idioma-bot, Deor, Cherryman~enwiki, VolkovBot, CWii, Jperki, Haim Berman, Chango369w, Ian Struan, Philip Trueman, TXiKiBoT, Cosmic Latte, Jynx-Me, BlueLint, Piperh, Una Smith, LeaveSleaves, Seb az86556, Alborz Fallah, Corwinlw, Tanner-Christopher, Ultafulta, Tomaxer, Mallerd, Chickyfuzz14, Dessymona, Wavehunter, Swgrad, NHRHS2010, Ayça Leovinus, SieBot, Rajaeger, Ttonyb1, Paul20070, Euryalus, Jauerback, Gerakibot, Da Joe, Dawn Bard, Flavius Belisarius, SE7, Triwbe, Gravitan, Tailbone, Samogon, Keilana, Alexbrn, Oda Mari, Oxymoron83, AngelOfSadness, Baseball Bugs, Pmitchev, Irock2007, Dchwalisz, Hobartimus, Sticksss, Jacob.jose, Wuhwuzdat, Maralia, GordonMarjory, FloratheDora, Vonones, Hhipuff, ClueBot, DemoXdems, The Thing That Should Not Be, Rjd0060, Jan1nad, Mx3, Desoto10, Unbuttered Parsnip, Gaia Octavia Agrippa, TheOldJacobite, Spiderpig69, Hafspajen, CounterVandalismBot, Estevoaei, Bellatrix Kerrigan, Pinkpearsss, Neonghost, Cybertwerp, Passargea, DragonBot, Tamemel, Excirial, Gnome de plume, Jusdafax, Mr499, Rohitsmom, Gulmammad, Jsmaine22, Sansumaria, Drawn Some, Randomiseverything, Gundersen53, ChrisHodgesUK, Aitias, Leighton21, Ipunchouthorses, Olakuk, Vanished User 1004, Delicious carbuncle, Spitfire, Namsos, Rror, Ianbarr, WikiDao, Daisyduck5656, Moosedavid, Robroberto, Addbot, Some jerk on the Internet, RobinClay, Cherry Red Toenails, SAVETHETREES51, Innv, Ronhjones, TutterMouse, Fieldday-sunday, D0rkypn0y1029, Mala011, Vishnava, Fluffernutter, LaaknorBot, Morning277, CarsracBot, Bassbonerocks, Ld100, Spanky"csl" , Shekure, Craigsjones, Tide rolls, OlEnglish, Zorrobot, Dj150888, Fried rice hp, Eturcija, Aquamelli, Luckas-bot, Yobot, 2D, Tastyfast, Sarrus, Brougham96, Spunkmuffin, Mdw0, Rjanag, Killiondude, Jim1138, Rapist333, Kingpin13, Davidpar, Materialscientist, Hunnjazal, Citation bot, Bob Burkhardt, NurseryRhyme, Apollo, .أحمد.غ.امديي24, Pkravchenko, MauritsBot, Xqbot, Capricorn42, Gigemag76, 4twenty42o, TechBot, ChildofMidnight, Dirkadirkajihad2, Dirkadirkajihad21, BBrue, Ruy Pugliesi, Earlypsychosis, Zefr, Amaury, Silverije, Brutaldeluxe, Redneckiam, Bjr18, Hamamelis, Toolfan5678, Sandcherry, Zxdftyhjnmklop, Roseyhere2serve, Frysalebald, Adler.fa, FrescoBot, Signigs, Ketchupisyum, Climent Sostres, Gillygob, HJ Mitchell, Hardcore Heaven, Greensev, Citation bot 1, Wrd234, Pinethicket, Bek the Conqueror, Vicenarian, HRoestBot, A8UDI, Achaemenes, OscarKosy, Btilm, Overhung, Σ, Pianoplonkers, Kibi78704, Crusoe8181, Tamibby, Trappist the monk, Alexmilt, Lotje, Arceupins, The wind or breeze, Vrenator, Xiefujie, Linguisticgeek, Suffusion of Yellow, 950049mnr, DARTH SIDIOUS 2, Rosieel, Swimmer32, Ilovewikisomuchh, RjwilmsiBot, DASHBot, J36miles, EmausBot, Orphan Wiki, WikitanvirBot, Keypher09, Randyjohnson8888, Ryanfoote, Boofs, Gummybearbrogan, TreacherousWays, Tommy2010, AndrewJMT, Wikipelli, Copperwinker, K6ka, Swammy1234567, Poulit, Comesturnruler, PBS-AWB, Garten646, Bryce Carmony, 1L0ve2rape, FinalRapture, Erianna, Rcsprinter123, Afrodita nz, Alborzagros, Deutschgirl, ChuispastonBot, Milad Mosapoor, Architect7, ClueBot NG, Smtchahal, Srise200, Muffinkido, Inkowik, Gooturk, MelbourneStar, Satellizer, Snotbot, Sitsat, Güzel günler yakın, Widr, Askic, GlassLadyBug, Oddbodz, Jer Hughes, Lionhead99, Electriccatfish2, Mark Marathon, Plantdrew, BOBSAGET69, Mmohsins, Steve Milburn, Wiki13, MusikAnimal, Cold Season, Jobin RV, Ahora, Alyssa1020, Writ Keeper, Nbahaji, Granateple, MySwagLevel, Simoncherry, Maurice Flesier, TBrandley, Evenflowmb, Klilidiplomus, Achowat, Lol.supercool, Nitrobutane, BattyBot, Undead Nightmare, Darorcilmir, Iifar, ChrisGualtieri, Kyledethier, JYBot, SantoshBot, Hmainsbot1, Mogism, Mangingbearpig, Lugia2453, Kevin12xd, Corn cheese, Skyreddit, Mary.falck.nuggs, LETMEMAKEADAMNACCOUNT, Chelac, Bernard R. Kiding, Fluffy Milkman, Chai.hadden, Amckinney14, Cherryjuiceconcentrate, Ginsuloft, SNUGGUMS, Leopardtail, Osnapitzmeh, Monkbot, Wvc19, MaranoFan, Biolongvistul, Audde, WyattAlex, Chadsworth, Wishkey123, AwesomeCreater12, Mebutler443, KasparBot, Theplayer96, HelenRose Eaton, Gotum, Sallymae47, Alanjthompson and Anonymous: 639

- **Plum** *Source:* http://en.wikipedia.org/wiki/Plum?oldid=663007285 *Contributors:* Kpjas, Vicki Rosenzweig, Malcolm Farmer, Andre Engels, PierreAbbat, Karen Johnson, Ellmist, Zoe, Heron, Montrealais, Quercusrobur, Olivier, DennisDaniels, Gdarin, Liftarn, Menchi, Eurleif, Minesweeper, Ahoerstemeier, Salsa Shark, Bogdangiusca, Andres, Jiang, Jeandré du Toit, Evercat, Mxn, WhisperToMe, Tpbradbury, Imc, Nv8200pa, Karukera, Samsara, Joy, Pollinator, PuzzletChung, Robbot, Hankwang, Chris 73, Ee00224, Meelar, Kent Wang, Christopher Parham, MPF, Mintleaf~enwiki, 0x6D667061, Sievert, Falcon Kirtaran, Decagon, Zeimusu, JoJan, MisfitToys, Kusunose, PDH, Rdsmith4, Bodnotbod, Neutrality, Marcus2, Mschlindwein, Generica, Mike Rosoft, Discospinster, Rich Farmbrough, Mani1, Jnestorius, Kelvinc, CanisRufus, Bletch, RoyBoy, Adambro, Bobo192, Fir0002, Yongxinge, Vanished user azby388723i8jfjh32, Mareino, Tom Yates, Jérôme, Alansohn, JYolkowski, Keenan Pepper, Ekko, Bart133, Hohum, Velella, Shoefly, Bsadowski1, Pekinensis, Richard Barlow, Camw, Rocastelo, MONGO, SCEhardt, Dysepsion, Graham87, Chun-hian, FreplySpang, Edison, Ketiltrout, Jake Wartenberg, Tangotango, HV, Ricardo Carneiro Pires, Josephs1, Cmouse, Eubot, Pfctdayelise, RexNL, ViriiK, Lemmikkipuu, Silversmith, DVdm, Gdrbot, WriterHound, Roboto de Ajvol, YurikBot, Hawaiian717, Jimp, Eupator, Chris Capoccia, Stephenb, CambridgeBayWeather, NawlinWiki, Dysmorodrepanis~enwiki, Badagnani, Justin Eiler, Matriak, Snagglepuss, DeadEyeArrow, Saric, Halera, Ali K, Astara, Katieh5584, Ajdebre, Elliskev, SmackBot, FocalPoint, Ashley thomas80, Aflm, Blue520, Svenlafe, Kintetsubuffalo, Gilliam, Isaac Dupree, Anwar saadat, Bluebot, Rkitko, Jprg1966, Godofbiscuits, Bazonka, TheLeopard, Octahedron80, Hongooi, Can't sleep, clown will eat me, Nima Baghaei, Bogdan1991, Nakon, NaySay, Seeminglee, Kevmin, Mgiganteus1, RomanSpa, Ian Dalziel, Fluppy, Peter Horn, Zapvet, BananaFiend, Newone, Courcelles, Tawkerbot2, Paulistano, JForget, Z003, Baskaufs, MarsRover, WeggeBot, Flying Saucer, Yaris678, Besieged, Gogo Dodo, Chasingsol, Doug Weller, Codetiger, Zdujic, Thijs!bot, HappyInGeneral, IXIA, Marek69, Stevanb, RoboServien, Escarbot, Konman72, Mikenorton, JAnDbot, Barek, MER-C, TheEditrix2, Bongwarrior, Jonathandon, Jjasi, Asaadi~enwiki, Japo, CapnPrep, Kostisl, Artaxiad, J.delanoy, Pharaoh of the Wizards, Jchahin13, Epruss, Uncle Dick, Jreferee, SpigotMap, Eric in SF, Balthazarduju, Rocket71048576, NewEnglandYankee, Jmcw37, Nadiatalent, Plumbum123, Swinquest, Idioma-bot, Chango369w, Anna Lincoln, Matahari Pagi, Rodrigo.T.Argenton, Sanfranman59, Seb az86556, BotKung, Mazarin07, Alborz Fallah, Doug, Tanner-Christopher, NHRHS2010, Norhelt, Krawi, Ric delg, Bentogoa, Aillema, Flyer22, Jojalozzo, SunPlum, Yerpo, Oxymoron83, KoshVorlon, Ravanacker, Dcattell, Seungkyu, Vonones, Martarius, Elassint, ClueBot, The Thing That Should Not Be, IceUnshattered, Kereokacola, Saleenfreak, Muscari, Meekywiki, Sevilledade, MARKELLOS, Pinkpearsss, Neverquick, Excirial, Jefflayman, Dedgeord, Rhododendrites, JamieS93, Svejk74, Bozejmonstera, La Pianista, Aitias, Samg939, Cheesysie, Berean Hunter, Johnuniq, SoxBot III, Facts707, Mr wonkynobby, Alexius08, MystBot, ElMeBot, MatthewVanitas, Rohondra, Spirit Of Tiger, Some jerk on the Internet, MrOllie, Download, Eranu, Philip29, CarsracBot, Cheesecakelolz, Cheesepieman, Debresser, Tide rolls, Lightbot, Luckas-bot, Yobot, TaBOT-zerem, Nallimbot, KamikazeBot, TestEditBot, ExtremeSquared, MacTire02, Pom 4 life, AnomieBOT, Galoubet, Golb12,

Kingpin13, Ulric1313, Materialscientist, Hunnjazal, E2eamon, Xqbot, Dovm, Gigemag76, Purplebackpack89, AnelZukic, Teamjenn, The Ink Daddy!, RibotBOT, Saalstin, TulliTZT, ATHFfan., N419BH, Hamamelis, Litlesniper04, AlimanRuna, Noder4, Tjmill, Pepper, Ahmed essam eldin, Hexafluoride, Krish Dulal, Intelligentsium, Redrose64, Galloramenu, Mreedjr, Pinethicket, Edderso, Diomedea Exulans, Pachouvia38, PooBrain03, Kibi78704, Turian, December21st2012Freak, Jojofroyo, Vrenator, Robertiki, Ram9775, Weedwhacker128, Suffusion of Yellow, Canyq, Joe9098, RjwilmsiBot, Timdog182003, Lankyjosh, Smartiger, Waso99, EmausBot, Immunize, AlberTux, Razor2988, Hage9a, Rajkiandris, Jrwilltackleu, AvicBot, Comesturnruler, ZéroBot, THATSBETTER, John Cline, Bobbyjoe67, H3llBot, ElliotMorrow, Donner60, Shemaroo, Evan-Amos, Trollofdeath, Tonu72, Isaacrubens, ClueBot NG, Edouard Albert, Chester Markel, Widr, Neohacker, Chillllls, Helpful Pixie Bot, Plantdrew, Theoldsparkle, BG19bot, Mattlucas95, Juicyolivia, Juro2351, Northamerica1000, Declangi, ApostleVonColorado, Wikih101, I am a female, Maurice Flesier, Nocturnal781, Darorcilmir, Riley Huntley, Aliwal2012, SantoshBot, Gicoro, Sminthopsis84, Webclient101, Mogism, Zardhunter, Javi20, Jussi123, Vanamonde93, AmaryllisGardener, Melonkelon, Lola999, Mqassem, Fgegypt, Babitaarora, AmbitiousFilmMaker, Ginsuloft, HalfGig, Noyster, Wikibradders, 1q3e5t7u, Xenxax, TrollMasta1999, TheQ Editor, Macklemorening, NQ, Monkeyexpert, JimboBaggins69, Dat oldmate69, Chachbuns, Hockeymuch, Randyortonexpert101 and Anonymous: 317

- **Prunus avium** *Source:* http://en.wikipedia.org/wiki/Prunus_avium?oldid=656950781 *Contributors:* Rmhermen, Ram-Man, Александър, Bogdangiusca, Imc, Pollinator, Hankwang, MPF, Zbihniew, Zscout370, Surachit, Merenta, Buaidh, Cruccone, Taragui, Graham87, T34, GoldRingChip, Ricardo Carneiro Pires, Eubot, Gdrbot, Gwernol, Roboto de Ajvol, Hede2000, Eupator, Stephenb, Dysmorodrepanis~enwiki, Botteville, Theda, Orcaborealis, SmackBot, Melchoir, Flibirigit, Hmains, JAn Dudík, Kurykh, Jamidwyer, OOODDD, Abrahami, Vertigo Acid, Kevmin, Soulkeeper, Bookworm15, RekishiEJ, Netol, Rosser1954, Thijs!bot, Epbr123, Escarbot, AntiVandalBot, JAnDbot, Plantsurfer, Krasanen, TheEditrix2, Kiore, R'n'B, Benjamint444, Nadiatalent, IceDragon64, HighKing, Idioma-bot, VolkovBot, TXiKiBoT, Timpul, Superruss, Mazarin07, Fraxinus Croat, SieBot, Moonriddengirl, Shawnlandden, Gerakibot, Faradayplank, Kentynet, ClueBot, LarryMorseDCOhio, Romney yw, Wikiuser100, Freetrashbox, Addbot, Some jerk on the Internet, Fluffernutter, CarterBar, Rosserlloyd, Canards, Yobot, Amirobot, KamikazeBot, AnomieBOT, Nefronus, Zangar, Xqbot, Hamamelis, Noder4, FrescoBot, XxTimberlakexx, Skyerise, Jauhienij, Lotje, Look2See1, Angrytoast, Joe Jenze, Erianna, Rcsprinter123, Bas-Celik, عم‌رو بن لئ‌ث‌وم, ClueBot NG, O.Koslowski, Helpful Pixie Bot, Jean-Pol GRANDMONT, Plantdrew, Vagobot, Declangi, AvocatoBot, Minsbot, Hsp90, EnzaiBot, Sminthopsis84, Timer90, 7thshadow1234, Impuls666666, Riversid and Anonymous: 51
- **Prunus padus** *Source:* http://en.wikipedia.org/wiki/Prunus_padus?oldid=635890630 *Contributors:* Ahoerstemeier, Bogdangiusca, Imc, MPF, JoJan, Kahkonen, Stepp-Wulf, DanielCD, EugeneZelenko, Rich Farmbrough, Xezbeth, CanisRufus, Caeruleancentaur, Etxrge, Stemonitis, Ketiltrout, Rjwilmsi, Ricardo Carneiro Pires, Eubot, Karelj, Gdrbot, Dj Capricorn, YurikBot, RobotE, Pigman, Dysmorodrepanis~enwiki, HHHH, Jonathan Hornung, Orcaborealis, KnightRider~enwiki, Melchoir, Hmains, Rkitko, Elagatis, Eliyak, Kevmin, Novangelis, Kaarel, Rosser1954, Thijs!bot, JAnDbot, Plantsurfer, Krasanen, Soulbot, Jerem43, R'n'B, Aleksandr Grigoryev, Bumper12, Nadiatalent, Idioma-bot, TXiKiBoT, Billinghurst, AlleborgoBot, SieBot, Sanya3, LarRan, Fangjian, ClueBot, Fadesga, Cygnis insignis, Estevoaei, Ajterry, DumZiBoT, MystBot, Addbot, Cuaxdon, Rogue74, Tassedethe, Numbo3-bot, DK4, Luckas-bot, AnomieBOT, MauritsBot, Xqbot, Hamamelis, D'ohBot, Micromesistius, EmausBot, Rcsprinter123, Arashiyama, Amdb73, Maasaak, Movses-bot, Plantdrew, Roozitaa, JYBot, Sminthopsis84, Impuls666666, Adenin and Anonymous: 23
- **Prunus spinosa** *Source:* http://en.wikipedia.org/wiki/Prunus_spinosa?oldid=630091459 *Contributors:* Jadepearl, Bogdangiusca, Andres, Markb, Imc, Morwen, Topbanana, Wetman, Robbot, Psychonaut, Seglea, GerardM, DocWatson42, MPF, JoJan, Elroch, Eep^{2}, Xezbeth, CanisRufus, Linkoman, Jonathan Drain, Sean Kelly, Guaca, Mtiedemann, Dabbler, Tony Sidaway, Mnemo, Dave.Dunford, SteinbDJ, Kay Dekker, Stemonitis, Angr, Woohookitty, Richard Barlow, Rocastelo, MrDarcy, GregorB, Paxsimius, Kugamazog, Darguz Parsilvan, Ricardo Carneiro Pires, Eubot, TheDJ, Guliolopez, Gdrbot, YurikBot, RobotE, Eraserhead1, Jurijbavdaz, NawlinWiki, Dysmorodrepanis~enwiki, Badagnani, Zwobot, Epipelagic, Alias Flood, GrinBot~enwiki, That Guy, From That Show!, SmackBot, Emoscopes, Unyoyega, Feebtlas, Commander Keane bot, Gilliam, Hmains, Anwar saadat, Mirokado, Rkitko, Raymie, Riisikuppi~enwiki, Javier Arambel, Tsca.bot, Meryt, Eliyak, Kevmin, RekishiEJ, Hakluyt bean, Vargob, Bug boy, Rosser1954, Escarbot, JAnDbot, TheEditrix2, Lost tourist, Peter coxhead, Robertgreer, Nadiatalent, Treisijs, Richard New Forest, Echosmoke, VolkovBot, TXiKiBoT, Mks004, JhsBot, Hythlodayalmond, SieBot, Purbo T, Dlh-stablelights, Kentynet, Hordaland, Tatterfly, Missing Ace, Alma mater (En), ClueBot, E3k, Auntof6, Bagworm, PixelBot, Lestrad, BOTarate, MystBot, Addbot, Stewartford08, Cuaxdon, AndersBot, Kisbesbot, Lightbot, Luckas-bot, Yobot, AnomieBOT, Bob Burkhardt, ArthurBot, Jay L09, Xqbot, Apothecia, Gigemag76, J04n, GrouchoBot, SassoBot, ReformatMe, Hamamelis, FrescoBot, Davmatti, Kobrabones, Mishae, TjBot, EmausBot, WikitanvirBot, Slightsmile, Johnmartins, Auró, ZéroBot, PBS-AWB, Matthewcgirling, Amdb73, ClueBot NG, Movses-bot, Curb Chain, BG19bot, Krenair, Cursormania1947, ApostleVonColorado, Dexbot, Guyauguilar, Sminthopsis84, Brendan111 and Anonymous: 59
- **Elm** *Source:* http://en.wikipedia.org/wiki/Elm?oldid=662686641 *Contributors:* Vicki Rosenzweig, Wesley, William Avery, Azhyd, Camembert, Jaknouse, Montrealais, Michael Hardy, Mgmei, Liftarn, (, Ahoerstemeier, Jimfbleak, Docu, Muriel Gottrop~enwiki, Rossami, Jeandré du Toit, David Newton, Marshman, Imc, Wiwaxia, Chl, UninvitedCompany, Donarreiskoffer, Robbot, Pigsonthewing, PBS, Hadal, DocWatson42, MPF, Bobblewik, Chowbok, Yath, Antandrus, JoJan, 1297, DanielZM, DanielCD, Cnyborg, YUL89YYZ, Bender235, Swid, Joanjoc~enwiki, RoyBoy, Guettarda, Jesse.bye, SpeedyGonsales, Nk, Alansohn, AzaToth, L33th4x0rguy, Proski, Kazvorpal, Woohookitty, Richard Barlow, RHaworth, PoccilScript, Mark K. Jensen, Macronyx~enwiki, ArCgon, FreplySpang, Mendaliv, Ketiltrout, Coemgenus, FlaBot, Daderot, Eubot, Ground Zero, RexNL, Krun, Lmatt, Chobot, Jaraalbe, Gdrbot, Bgwhite, YurikBot, Wavelength, RussBot, Scott5834, NawlinWiki, Cheyne, Dysmorodrepanis~enwiki, Zwobot, Dv82matt, Tonywalton, FF2010, Luk, Originalbigj, NorthernFire, Chris the speller, Rkitko, Master of Puppets, Berton, Melburnian, Darth Panda, Bruce Marlin, AntonBryl, Kukini, Efilnickufesin, Gobonobo, NewTestLeper79, Optimale, Sannab, Peter Horn, Dl2000, Ken McE, Ptelea, Harry Stoteles, Ewulp, Courcelles, Zootsuite, Ulmusenthu, Baskaufs, A Softer Answer, Daniel J. Leivick, Xabier Cid, Calvero JP, VPliousnine, Thijs!bot, NorwegianBlue, James086, Dfrg.msc, AntiVandalBot, Noroton, Storkk, JAnDbot, Davewho2, Plantsurfer, Roleplayer, Mary C., VoABot II, Dekimasu, Michael Goodyear, CTF83!, Taamu, Rob Lindsey, Autocratique, AlexiusHoratius, LedgendGamer, J.delanoy, Jerry, Katalaveno, Notreallydavid, Grmanners, M-le-mot-dit, Idioma-bot, Rodolph, VolkovBot, Somanypeople, TXiKiBoT, Oconnor663, Steven J. Anderson, Optigan13, Andy Dingley, Ngm29, Atubeileh, Paul J Williams, SieBot, Gerakibot, Alexbrn, Oxymoron83, Lightmouse, ImageRemovalBot, Dariomar77, ClueBot, The Thing That Should Not Be, Garyzx, Drmies, Fenwayguy, Excirial, Dickandharry, LarryMorseDCOhio, Barbyr, Thingg, Berean Hunter, XLinkBot, SilvonenBot, PL290, Badgernet, Addbot, SpellingBot, Cuaxdon, Lost on belmont, Proxima Centauri, XVI Chancer, Dagangsta001, Wikomidia, Erutuon, Bfigura's puppy, Luckas-bot, Yobot, Legobot II, AnomieBOT, BlackRaspberry, JackieBot, Materialscientist, Elmmapleoakpine, Citation bot, James500, Bob Burkhardt, Xqbot, Sionus, Srich32977, J04n, RibotBOT, Crashdoom, Eugene-elgato, Frozenevolution, FrescoBot, Krixtoffer, Solaricon, A little insignificant, Silesianus, DigbyDalton, Pinethicket, LittleWink, Avidmosh, Tobachnick, Bmclaughlin9, RedBot, Seanwinstanley, FoxBot, TobeBot, A p3rson, EmausBot, WikitanvirBot, Ashton 29, Sir jasper, Nickel4710, AvicBot, ZéroBot, PBS-AWB, Ftelia, Nojo78, Peter Karlsen, Rmashhadi, Purpledramallama, ClueBot NG, CocuBot, Baseball Watcher, Lag36, Braincricket, Widr, Helpful Pixie Bot, Plantdrew,

Roberticus, ElizabethCB123, Copsandrobbers, PhilippeMaurice, Galatians, Lugia2453, Wise zoologist, Crw2000, Thevideodrome, León de Alcalá, JaconaFrere, Lagoset, Monkbot, Elm44472, KasparBot and Anonymous: 180

- **Ulmus glabra** *Source:* http://en.wikipedia.org/wiki/Ulmus_glabra?oldid=652733305 *Contributors:* Ahoerstemeier, Hike395, Topbanana, Donarreiskoffer, Pigsonthewing, Angilbas, MPF, Bobblewik, Chowbok, Thincat, DanielCD, EugeneZelenko, Mani1, Hippophaë~enwiki, Velella, Stemonitis, PoccilScript, FlaBot, Eubot, RexNL, Gdrbot, YurikBot, Conscious, Gaius Cornelius, Cleared as filed, Extraordinary, Orcaborealis, Paul D. Anderson, Hirudo, Steve carlson, Rkitko, Salvor, Melburnian, Bazonka, Jimmy Pitt, Ptelea, Kaarel, ShelfSkewed, JaGa, R'n'B, Bumper12, Ljgua124, VolkovBot, Akerbeltz, Jaguarlaser, Niceguyedc, PixelBot, LarryMorseDCOhio, Rror, Dthomsen8, MystBot, Addbot, MagnusA.Bot, NjardarBot, Lightbot, Luckas-bot, Yobot, AnomieBOT, Sylwia Ufnalska, GrouchoBot, RibotBOT, I42, TobeBot, EmausBot, John of Reading, WikitanvirBot, Look2See1, Rcsprinter123, Helpful Pixie Bot, BG19bot, SeamusO'K, Impuls666666 and Anonymous: 13
- **Ulmus minor subsp. minor** *Source:* http://en.wikipedia.org/wiki/Ulmus_minor_subsp._minor?oldid=663314949 *Contributors:* Eugene van der Pijll, Donarreiskoffer, Pigsonthewing, MPF, Chowbok, Geni, DanielCD, Rich Farmbrough, Velella, Eubot, RexNL, CiaPan, Gdrbot, YurikBot, Rkitko, Melburnian, Ptelea, Sluzzelin, M-le-mot-dit, Lucasbfrbot, Lightbot, مانې, Yobot, Celuici, FrescoBot, LittleWink, Snotbot, Cntras, MerlIwBot, Impuls666666 and Anonymous: 13
- **Crataegus** *Source:* http://en.wikipedia.org/wiki/Crataegus?oldid=663102863 *Contributors:* Amillar, Anthere, Heron, Edward, Sannse, Timwi, Imc, PuzzletChung, Bearcat, Robbot, Dale Arnett, Pigsonthewing, Kristof vt, Ashley Y, UtherSRG, Jeffdelonge, TPK, MPF, MichaelHaeckel, Eoghan, Solipsist, Jackol, Keith Edkins, Slowking Man, Yath, JoJan, Karl-Henner, Klemen Kocjancic, Picapica, Famartin, Dr.frog, DanielCD, EugeneZelenko, Dave souza, Djordjes, Kwamikagami, Circeus, Foobaz, Nk, RaffiKojian~enwiki, Pearle, Eric Kvaalen, Rodw, Zeborah, Fledgeling, Mnemo, DrGaellon, Pauli133, Stemonitis, Pekinensis, Richard Barlow, TheAlphaWolf, Miwasatoshi, Cuchullain, BD2412, Rjwilmsi, Salix alba, Vuong Ngan Ha, Eubot, Jrtayloriv, Travis.Thurston, Benjwong, Narvalo, Gdrbot, Roboto de Ajvol, Hairy Dude, Mongol, Huw Powell, Pigman, Dysmorodrepanis~enwiki, Badagnani, Brian Crawford, Rmky87, TDogg310, ColinFine, Trainra, IceCreamAntisocial, Blacksand, Open2universe, Closedmouth, Petri Krohn, Mebden, SmackBot, Jihiro, Isaacwatts, Rkitko, Rogerthat, Hibernian, Vietlong, Gruzd, Trekphiler, Altawfik, DollyD, J. Finkelstein, Kevmin, Steipe, IronGargoyle, Maksim L., Harry Stoteles, Courcelles, Baskaufs, WeggeBot, Cydebot, Pinky sl, Edal, Escarbot, Jtswan, Storkk, ShadowKinght, JAnDbot, Deflective, Hydro, Arch dude, Sophie means wisdom, Magioladitis, Soulbot, Taamu, Nono64, Mike.lifeguard, Nadiatalent, Largoplazo, Idioma-bot, VolkovBot, TXiKiBoT, Twenty something, Wingedsubmariner, January2007, Shafranov, SieBot, StAnselm, Cymi, Da Joe, Rhanyeia, OKBot, IvanTortuga, ClueBot, Vulture19, Hmcfking, DumZiBoT, Alansplodge, Addbot, Cuaxdon, LaaknorBot, Flakinho, Luckas-bot, Legobot II, Julia W, AnomieBOT, Citation bot, Bob Burkhardt, Xqbot, Zefr, Wwbread, Ariya shookh, Brutaldeluxe, D'ohBot, Piandcompany, Salvidrim!, Kibi78704, TobeBot, MrX, MegaSloth, TjBot, EmausBot, Wikipelli, AvicBot, John Cline, Bollyjeff, Sagaciousphil, H3llBot, Erianna, Dialinn, Donner60, Architect7, ClueBot NG, Herbstopic, Marrier & Fruitful., Tai4ji2x, Helpful Pixie Bot, Curb Chain, Mark Marathon, Minsbot, Darorcilmir, Sminthopsis84, FiverFan65, Lignum, CorinneSD, Corn cheese, Lawnaut, GeeIsUs., SkepMax, Karinpower, Normdog, MudpieQueen and Anonymous: 86
- **Crataegus monogyna** *Source:* http://en.wikipedia.org/wiki/Crataegus_monogyna?oldid=662813123 *Contributors:* Александър, Imc, Dimadick, Bearcat, Robbot, Alan Liefting, MPF, Michael Devore, Sonjaaa, JoJan, Karl-Henner, Famartin, DanielCD, EugeneZelenko, Dave souza, El C, Wytukaze, Fledgeling, Amorymeltzer, RyanGerbil10, Stemonitis, Pekinensis, Woohookitty, Eras-mus, Magister Mathematicae, BD2412, Rjwilmsi, Eubot, Margosbot~enwiki, Mongreilf, Gdrbot, Kummi, YurikBot, RobotE, Huw Powell, Badagnani, CorbieVreccan, Asarelah, Arthur Rubin, Mais oui!, DoriSmith, SmackBot, Isaacwatts, Schmiteye, Rkitko, Tsca.bot, Maelbrigda, Springnuts, Bezapt, Valfontis, Kevmin, Laogeodritt, Ptelea, Civil Engineer III, Courcelles, Shandris, WeggeBot, Neelix, Cydebot, Ambo100, Narayanese, Rosser1954, Epbr123, A3RO, Storkk, JAnDbot, Arch dude, Cynwolfe, Crunchy Numbers, Trusilver, Numbo3, Mike.lifeguard, Dargaud, James A. Stewart, Grmanners, Trilobitealive, Nadiatalent, Idioma-bot, Tctwood, Bfpage, Elie plus, Diego Grez, Lorwood, Sean.hoyland, Llywelyn2000, Alexbot, Thingg, BellaStarlight, PL290, Reporein, Addbot, Jojhutton, Lucian Sunday, Krano, Ptbotgourou, TaBOTzerem, Jdeb901, AnomieBOT, Princess Maria, DZNRKkCV, Bob Burkhardt, Obersachsebot, Xqbot, Sionus, GrouchoBot, FrescoBot, Stephen Morley, DrilBot, Soistiga, Andrew69., Baltshazzar, TobeBot, Lotje, Miguel Gómez de Aranda, Stegop, EmausBot, Look2See1, Jobe Eculen, PBS-AWB, Mcurlis, Matthewcgirling, Erianna, Rcsprinter123, Break Through Pain, عمرو بن لثوم, Michael Bailes, JacobStrauss, MerlIwBot, ChrisGualtieri, Curritocurrito, Petoassist, Sminthopsis84, Julian1986, ArmbrustBot, MrScorch6200, Trixie05 and Anonymous: 57
- **Crataegus laevigata** *Source:* http://en.wikipedia.org/wiki/Crataegus_laevigata?oldid=660169655 *Contributors:* JerryFriedman, MPF, Famartin, Ardric47, Melaen, RyanGerbil10, Stemonitis, Strobilomyces, Eubot, Gdrbot, Ytrottier, Zwobot, Isaacwatts, Rkitko, Kevmin, Alaibot, Pinky sl, Rosser1954, Thijs!bot, Kbthompson, Smartse, JAnDbot, Francis Tyers, Wlodzimierz, PurpleHz, HamStation, Nadiatalent, DorganBot, Idioma-bot, VolkovBot, Kyle the bot, Rei-bot, Jaguarlaser, Addbot, CarsracBot, Luckas-bot, Yobot, DSisyphBot, Thehelpfulbot, LucienBOT, RjwilmsiBot, Look2See1, MerlIwBot, NotWith, Darorcilmir, Mahieddine23, Sminthopsis84, Xanthomelanoussprog, Seamus Ward, Impuls666666, Christinathuang and Anonymous: 4
- **Crataegus × media** *Source:* http://en.wikipedia.org/wiki/Crataegus_%C3%97_media?oldid=637495596 *Contributors:* Circeus, Stemonitis, SmackBot, Rkitko, Kevmin, Arch dude, Lenticel, Nadiatalent, Addbot, SpBot, Luckas-bot, Yobot and Sminthopsis84
- **Hazel** *Source:* http://en.wikipedia.org/wiki/Hazel?oldid=665497322 *Contributors:* Andre Engels, Stan Shebs, Glenn, Raven in Orbit, Imc, Eugene van der Pijll, Naddy, Hadal, UtherSRG, GerardM, DocWatson42, MPF, Elf, Yak, JoJan, DanielZM, Xezbeth, Circeus, Nk, Ranveig, Alansohn, AnnaP, Sheehan, Hippophaë~enwiki, Velella, Iustinus, Stemonitis, Richard Barlow, Dysepsion, NatusRoma, Eubot, Gdrbot, Bgwhite, RussBot, Pigman, Anomalocaris, NawlinWiki, E rulez, .marc., PTSE, Nvd, Fram, Fastifex, SmackBot, RlyehRising, Commander Keane bot, Bluebot, Rkitko, Epastore, Gruzd, Can't sleep, clown will eat me, Raynethackery, Kingdon, SilkTork, Kevmin, Peter Horn, Squirepants101, Iridescent, Tawkerbot2, DumbBOT, John Lake, Vanished User jdksfajlasd, TonyTheTiger, Storkk, Sluzzelin, JAnDbot, Ataltane, VoABot II, Dekimasu, Theroadislong, BetBot~enwiki, R'n'B, AlexiusHoratius, J.delanoy, Miskwito, Idioma-bot, VolkovBot, ABF, Atubeileh, Graminophile, Lascorz, ClueBot, Rockfang, Alexbot, Rhododendrites, Tyler, Nephsam, Addbot, Elishabet, Highfivesallround, CarsracBot, Glane23, Peti610botH, Kingsix6878, Zorrobot, Luckas-bot, Yobot, TaBOT-zerem, Archon 2488, JackieBot, Materialscientist, Hiroko hamster, Obersachsebot, Weepingraf, Srich32977, GrouchoBot, AVBOT, Lecheminlu, D'ohBot, Torresthegod9, I dream of horses, RedBot, Cnwilliams, Kgrad, Trappist the monk, Zanhe, Lotje, Reaper Eternal, The Utahraptor, Hrhsii, Slon02, Tommy2010, Алтухов Сергей, Wayne Slam, DASHBotAV, ClueBot NG, CocuBot, Bped1985, Osterluzei, Kasirbot, MerlIwBot, Gob Lofa, WNYY98, Who R you?, Darorcilmir, YFdyh-bot, FiverFan65, Sonĝanto, Tortie tude, Joseph Laferriere, Monkbot, OreoFriends4life and Anonymous: 95
- **Corylus avellana** *Source:* http://en.wikipedia.org/wiki/Corylus_avellana?oldid=662673109 *Contributors:* Octothorn, Dominus, Ahoerstemeier, Stan Shebs, Imc, Morwen, Taxman, Hankwang, Seglea, Naddy, GerardM, Radagast, Albatross2147, Tremolo, DocWatson42,

MPF, Rick Block, Avaragado, JoJan, Karl-Henner, Mrtrey99, Ukexpat, Sonett72, TheObtuseAngleOfDoom, Njh@bandsman.co.uk, Ma'ame Michu, Wikiacc, Sn0wflake, Mani1, Stbalbach, Ruyn, Laurascudder, Femto, Jigorou, Guettarda, Bobo192, Circeus, Fir0002, Adrian~enwiki, Cavrdg, Quasicharacter, Nk, Hesperian, Ranveig, AnnaP, Velella, Aka, Harej, Teliwhy, RyanGerbil10, Stemonitis, Angr, Richard Barlow, Mrs Trellis, Sengkang, Wikix, Eubot, Nihiltres, Lemmikkipuu, Patientone, Gdrbot, Roboto de Ajvol, YurikBot, RobotE, Huw Powell, RussBot, Conscious, Dysmorodrepanis~enwiki, Badagnani, NickBush24, SkarmoutsosV, E rulez, Zwobot, Mateo LeFou, RG2, Malcolm Morley, SmackBot, Christopherk, TestPilot, Toddintr, Anwar saadat, Rkitko, Quinsareth, Gruzd, Raynethackery, Khoikhoi, DickSummerfield, Rory096, AThing, Valfontis, T-dot, SilkTork, Dumarest, Dysmachus, Syrcatbot, 16@r, DabMachine, Kaarel, Kaygtr, Disambiguator, CmdrObot, Compn, Richard Keatinge, YorkBW, Casliber, Thijs!bot, TonyTheTiger, Escarbot, Smartse, Sgtfarmer, Storkk, JAnDbot, Doctor yellow, Asaadi~enwiki, LorenzoB, Hbent, Mermaid from the Baltic Sea, R'n'B, Wlodzimierz, Rgoodermote, Keithkml, Acalamari, Treisijs, Idioma-bot, VolkovBot, Haim Berman, Philip Trueman, Somanypeople, TXiKiBoT, Triplejumper, Una Smith, Autodidactyl, Jeff.U, Bouma~enwiki, Thunderbuck ram, Jaguarlaser, Logan, Atubeileh, Ugurzeki, SieBot, QualiaBot, Paulbrock, Mimihitam, PlantTrees, Graminophile, DragonBot, LarryMorseDCOhio, Joopwiki, DumZiBoT, Neuralwarp, Kbdankbot, Addbot, C3r4, Irenegirones, Materialscientist, Citation bot, Husnualparslan, DSisyphBot, GrouchoBot, SassoBot, Nicholas Sund, FrescoBot, Kvant sistem, Schnobby, AstaBOTh15, RedBot, Steve2011, BotdeSki, EmausBot, Look2See1, GoingBatty, Kmoksy, Rcsprinter123, ClueBot NG, Primergrey, Ejensyd, Zerosprite, Justincheng12345-bot, Dexbot, Dan Mihai Pitea, Impuls666666, KasparBot and Anonymous: 93

- **Hornbeam** *Source:* http://en.wikipedia.org/wiki/Hornbeam?oldid=645256719 *Contributors:* SimonP, David spector, Heron, Quercusrobur, Ram-Man, TeunSpaans, Ahoerstemeier, Stan Shebs, Ffransoo, Pedant17, Marshman, Imc, Lumos3, Robbot, Naddy, UtherSRG, Lysy, DocWatson42, MPF, Fudoreaper, Yath, Rich Farmbrough, Circeus, Nk, Flammifer, HasharBot~enwiki, SteinbDJ, Stemonitis, Richard Barlow, Spettro9, Eubot, Chobot, Gdrbot, YurikBot, Wavelength, Ragesoss, Ormanbotanigi, BonsaiViking, SmackBot, Rkitko, Gruzd, Bruce Marlin, Huon, Vildricianus, Anlace, Kevmin, JorisvS, Sannab, Iridescent, Rwst, Thijs!bot, Osborne, Escarbot, Fatidiot1234, Aelwyn, JAnDbot, Krasanen, Olaf Studt, Chiswick Chap, Tesscass, TXiKiBoT, Rei-bot, Timfields, SieBot, Alexbrn, Lascorz, ClueBot, Estirabot, Addbot, مانيم, Zorrobot, Luckas-bot, 金翅大鹏鸟, Citation bot, Bob Burkhardt, ArthurBot, Xqbot, XZeroBot, Srich32977, GrouchoBot, Micromesistius, RedBot, EmausBot, Wildlatin, Elspooky, Stainless steel cat, ChuispastonBot, Gob Lofa, BattyBot, Dararcilmir, AmaryllisGardener, Joseph Laferriere, Monkbot and Anonymous: 30
- **Carpinus betulus** *Source:* http://en.wikipedia.org/wiki/Carpinus_betulus?oldid=655047285 *Contributors:* Ahoerstemeier, Stan Shebs, Naddy, MPF, Picapica, Xezbeth, Circeus, Andrew Gray, RyanGerbil10, Stemonitis, Kelisi, Jon Harald Søby, Eubot, Shao, Gdrbot, YurikBot, RobotE, Dysmorodrepanis~enwiki, Ormanbotanigi, SmackBot, Rkitko, Gruzd, Carnby, The Man in Question, Ptelea, Ies~enwiki, Ambo100, Casliber, JamesAM, Andriyp, JAnDbot, R'n'B, Maproom, Kvdveer, Idioma-bot, Jaguarlaser, SieBot, QualiaBot, Willow 05, DerBorg, Chhe, Чръный человек, SilvonenBot, Mm40, MystBot, Albambot, Addbot, AndersBot, FiriBot, LinkFA-Bot, Kingsix6878, Lightbot, مانيم, Yobot, El Grafo, ArthurBot, GrouchoBot, Brutaldeluxe, LucienBOT, AstaBOTh15, Ripchip Bot, Look2See1, ZéroBot, Matthewcgirling, ChuispastonBot, Dararcilmir, Dexbot, Epicgenius, Ercé, A6tf3t, Impuls666666 and Anonymous: 24
- **Holly** *Source:* http://en.wikipedia.org/wiki/Holly?oldid=665416502 *Contributors:* Shd~enwiki, Nonenmac, Jaknouse, TeunSpaans, Michael Hardy, Kwertii, Jbotz, Docu, Darkwind, Kaihsu, BRG, Jengod, Wik, Imc, Oaktree b, David.Monniaux, Pollinator, Earl Andrew, Pigsonthewing, Kristof vt, WormRunner, Academic Challenger, Diderot, Hadal, UtherSRG, Thehappysmith, Cyrius, Scyrma, DocWatson42, MPF, Bkonrad, Zumbo, Remy B, Solipsist, SWAdair, Andycjp, Slowking Man, Yath, Gzuckier, Beland, JoJan, Kesac, Bepp, Joyous!, Oknazevad, Chmod007, Freakofnurture, DanielCD, Discospinster, LindsayH, Kbh3rd, Kwamikagami, Bobo192, Smalljim, Bbartlog, Kx1186, Hesperian, Sam Korn, Stephen G. Brown, Jérôme, Sjschen, Titanium Dragon, Tony Sidaway, Mikeo, BDD, Kazvorpal, Tm1000, Stemonitis, Angr, Richard Barlow, JarlaxleArtemis, Scjessey, Kelisi, Grika, Prashanthns, Tslocum, Deltabeignet, Magister Mathematicae, Kalmia, BD2412, FreplySpang, Rjwilmsi, Nightscream, Psyghost, Heah, Ricardo Carneiro Pires, Dar-Ape, Eubot, RexNL, Gurch, Wgfcrafty, Gdrbot, WriterHound, Snappy, Scott5834, Stephenb, CambridgeBayWeather, Bovineone, Enigmatick, Thane, NawlinWiki, Dysmorodrepanis~enwiki, Pterodactyler, Grafen, KeithD, Nineteenthly, E rulez, TDogg310, Epipelagic, DeadEyeArrow, IceCreamAntisocial, Zzuuzz, Anarkitekt, Rms125a@hotmail.com, Crystallina, SmackBot, Brian1979, Vald, EncycloPetey, Me haridas, Ohnoitsjamie, Stanking, Rkitko, Persian Poet Gal, Nick Levine, Onorem, Bardsandwarriors, Threeafterthree, Khoikhoi, Nakon, TedE, Blake-, Ggpauly, Ultraexactzz, Richard0612, Valfontis, Aleenf1, 16@r, Shangrilaista, Noah Salzman, Caiaffa, Elintripido, Walton One, Courcelles, SkyWalker, Insanephantom, Lavateraguy, Dgw, NickW557, Fairsing, Cydebot, Gogo Dodo, JFreeman, Dancter, Odie5533, Tawkerbot4, Shirulashem, Damianrafferty, Voldemortuet, Casliber, Rosser1954, Thijs!bot, Epbr123, Andyiscool3232, Raeven0, John254, Jennifer Brooks, Mentifisto, Sidasta, AntiVandalBot, Fatidiot1234, Jayron32, Jj137, Joe Schmedley, Sci girl, LegitimateAndEvenCompelling, ShadowKinght, Mikenorton, JAnDbot, Deflective, MER-C, Skomorokh, Plantsurfer, Oozab, Some thing, Denimadept, Magioladitis, Bongwarrior, VoABot II, Swpb, Michael Goodyear, EvilFred, Zephyr2k~enwiki, IP Singh, Catgut, Animum, Allstarecho, Valerius Tygart, MartinBot, Alex LaPointe, Ben MacDui, Rettetast, Edimmer, CommonsDelinker, PrestonH, Sibi antony, Tgeairn, J.delanoy, Captain panda, Nev1, Eliz81, Lemur12, Chiswick Chap, Richard D. LeCour, Rosenknospe, Joka1991, SJP, Cometstyles, Bonadea, Squids and Chips, Idioma-bot, Deor, ABF, Amakila, Haade, Barneca, Philip Trueman, TXiKiBoT, ThinkHappyThoughtsx, Iambeaniegirl, Anna Lincoln, Luuva, Vinayaraj, Steven Weston, D. Recorder, Hsjenk2, Fabullus, Winchelsea, Anglicanus, Flyer22, Alexbrn, Oxymoron83, Smilesfozwood, Take flight112, Macy, Jack the Stripper, Spartan-James, Wuhwuzdat, Deminimis, Jons63, Tanvir Ahmmed, ClueBot, The Thing That Should Not Be, USHIRO Satoshi, Niceguyedc, Nikzbitz, RafaAzevedo, Hollimc, Excirial, Mynameisnotpj, Jusdafax, Kevin Rudd 69, Subdolous, Tnxman307, Boobies3000, CMW275, Thingg, Amaltheus, Kfalk89, SoxBot III, Vanished User 1004, Hollyg85, Little Mountain 5, Noctibus, Vianello, MystBot, Jimmyjames07, Heygirlhey0793, Kembangraps, MatthewVanitas, Addbot, Cte411, HollyEllen, Willking1979, Knight of Truth, Wikimichael22, CanadianLinuxUser, Cst17, Potottoefarm, Tide rolls, Lightbot, مانيم, MuZemike, Ben Ben, Drpickem, Luckas-bot, Yobot, 2D, Wikipedian2, Gobbleswoggler, Amyandjay, Lamy626, Blackisnewpink175, AnaknqAraw, IW.HG, AnomieBOT, Nortmannus, Jim1138, AdjustShift, LlywelynII, Ulric1313, NickK, RichardCorlett, Roux-HG, Quebec99, Xqbot, Capricorn42, LucieCouturex, Wisems, Maddie!, Srich32977, GrouchoBot, Brutaldeluxe, Shadowjams, PM800, VS6507, Mystickey, StaticVision, Rachelowns, ZenerV, Citation bot 1, Pinethicket, Vicenarian, Green Deane, Impala2009, Barras, Lstickle79, Hollymoffattt, Crusoe8181, Orenburg1, Vrenator, Lkjhgfdsa 0, Suffusion of Yellow, DARTH SIDIOUS 2, Andrea105, Regancy42, EmausBot, Loveygoldfish14, GoingBatty, ZéroBot, Josve05a, Idh0854, Monterey Bay, Farfromhere001, Nyar94, 28bot, عم رو بن لئ ثوم, ClueBot NG, PaleCloudedWhite, YellowPlant, Kasirbot, Costesseyboy, Widr, GlassLadyBug, Sonia Murillo Perales, Helpful Pixie Bot, Tyndal, Jennylovesholly, Curb Chain, Plantdrew, Arnavchaudhary, BendelacBOT, Declangi, Dan653, Kevachaché, Mm98un, Klilidiplomus, Dararcilmir, GoShow, Zeroyon01, MadGuy7023, Ffion9, Mogism, Corbacon, Sophie55555, SteenthIWbot, The Anonymouse, HollyKatieAuna1297, Monfreres, Hollytreen, Sɛvınti faıv, UnluckyJohnThomas, Jnarodowiec, Nightphoenix90, Gihan Jayaweera, Joseph Laferriere, Monkbot, Notavandleonlyaccount, Bobyjoerocks76, Holly the bird, Buttsaggington224, Jimmysavbumbum and Anonymous: 382
- **Ilex aquifolium** *Source:* http://en.wikipedia.org/wiki/Ilex_aquifolium?oldid=645584785 *Contributors:* Wayne Hardman, Imc, Robbot,

MPF, Bepp, Famartin, Man vyi, Hesperian, BlueCanoe, Rjwilmsi, Vegaswikian, Ricardo Carneiro Pires, Eubot, Gdrbot, Scott5834, Nineteenthly, Asarelah, Orcaborealis, Profero, Valfontis, LadyofShalott, Lavateraguy, Rwflammang, ShelfSkewed, Ken Gallager, Casliber, Rosser1954, JustAGal, Escarbot, Flami72, J Dezman, Idioma-bot, Philip Trueman, Jaguarlaser, SieBot, Frans Fowler, SchreiberBike, BOTarate, Tdslk, DumZiBoT, Joe1352, Addbot, SpillingBot, CarsracBot, LinkFA-Bot, Kingsix6878, Laikayiu, Yobot, Amirobot, AnomieBOT, Ulric1313, Citation bot, Gigemag76, GrouchoBot, A dullard, SassoBot, Shadowjams, D'ohBot, PigFlu Oink, Pinethicket, Andrew69., FoxBot, EmausBot, WikitanvirBot, Look2See1, Sky380, Rcsprinter123, عم‌رو بن لئ‌ثوم, ClueBot NG, Sonia Murillo Perales, Helpful Pixie Bot, BG19bot, Mark Arsten, Darorcilmir, Dexbot, Sminthopsis84, Randykitty, Lemnaminor, ArmbrustBot, Monkbot and Anonymous: 35

- **Juniper** *Source:* http://en.wikipedia.org/wiki/Juniper?oldid=663192328 *Contributors:* RobLa, Nonenmac, Collabi, Ahoerstemeier, Jimfbleak, Bogdangiusca, Hike395, Marshman, Nv8200pa, Donarreiskoffer, Robbot, WormRunner, Scythian99, Lupo, MPF, Matt Crypto, Gadfium, LiDaobing, Yath, Quadell, Kvasir, JoJan, Burschik, Fanghong~enwiki, Mike Rosoft, Rich Farmbrough, Paul August, Swid, MBisanz, El C, Kwamikagami, Summer Song, BrokenSegue, Man vyi, RaffiKojian~enwiki, Hesperian, Stephen G. Brown, Amorymeltzer, Woohookitty, Richard Barlow, Bunchofgrapes, Rjwilmsi, FlaBot, Eubot, Chobot, Gdrbot, YurikBot, Phantomsteve, Monkey Tennis, Limulus, Eleassar, Curtis Clark, Dysmorodrepanis~enwiki, Zwobot, CorbieVreccan, CLW, IceCreamAntisocial, Eno-ja, Extreme Unction, SmackBot, Melchoir, KocjoBot~enwiki, Hardyplants, Edgar181, Rkitko, BullRangifer, Andrew Dalby, Dale101usa, Sannab, Peter Horn, MTSbot~enwiki, BranStark, ChazYork, Túrelio, Sababu, Victoriagirl, Pfagerburg~enwiki, Ntsimp, AniMate, Thijs!bot, Dawnseeker2000, Silver Edge, Nipisiquit, Chill doubt, Mutt Lunker, JAnDbot, Fractaloctal, Deflective, Krasanen, .anacondabot, Magioladitis, Bongwarrior, VoABot II, Lucyin, Tinucherian, 28421u2232nfenfcenc, Pere prlpz, MartinBot, R'n'B, CommonsDelinker, J.delanoy, Maproom, Acalamari, M-le-mot-dit, Ferahgo the Assassin, Hmsbeagle, Idioma-bot, Spazzman06, Deor, Indubitably, Philip Trueman, Fcb981, Lamro, Jocmnkelknoincm, BotanyBot, Truthanado, SieBot, QualiaBot, John Ivans, Wilson44691, Martarius, De728631, ClueBot, Pointillist, Seanwal111111, PixelBot, Fuzz22, Lartoven, Mweites, Doprendek, XLinkBot, Diamond-blonde, Abercrombiegirl123, Dsimic, Addbot, Cuaxdon, GD 6041, CanadianLinuxUser, LaaknorBot, Beburg66, Yousayyesisayno, Flakinho, Lightbot, Jhscott89, Luckas-bot, Persian Gulf 4ever, Bjoertvedt, KamikazeBot, Ijl53, AnomieBOT, JackieBot, Bob Burkhardt, Xqbot, Itineranttrader, Hamamelis, Empayton, Ali Mohammad Khilji, Aslam Kassi, LSG1-Bot, FrescoBot, Longrim, Pinethicket, RedBot, Dryas, Jauhienij, FoxBot, ZhBot, Enauspeaker, EmausBot, WikitanvirBot, PBS-AWB, Stainless steel cat, Erianna, Alcatraz ii, Anonimski, Hatifnatter, Blas3nik, ChuispastonBot, Terraflorin, عم‌رو بن لئ‌ثوم, ClueBot NG, Baloch Baba, Helpful Pixie Bot, Electriccatfish2, Tholme, Plantdrew, BG19bot, Gomada, Solistide, Justincheng12345-bot, Graphium, Secret Frog, Luciferismysavior666, KasparBot and Anonymous: 113
- **Juniperus communis** *Source:* http://en.wikipedia.org/wiki/Juniperus_communis?oldid=658881083 *Contributors:* Nonenmac, Angela, Poor Yorick, Marshman, Owen, Robbot, Kristof vt, Pengo, MPF, Mikez, Manuel Anastácio, JoJan, Burschik, Metron, CanisRufus, Pt, Olve Utne, Nk, Hesperian, Chino, AnnaP, Velella, HenkvD, Adrian.benko, Stemonitis, Woohookitty, Richard Barlow, Oliphaunt, Andrea.gf, Bunchofgrapes, Rjwilmsi, Ricardo Carneiro Pires, Eubot, Gdrbot, Eleassar, Curtis Clark, Snek01, BOT-Superzerocool, Asarelah, CLW, Robost, Wsiegmund, SmackBot, Christian-Langner, SchfiftyThree, Deli nk, Smooth O, Kingdon, JzG, Lazylaces, Artman40, Dl2000, Kaarel, Victoriagirl, Pfagerburg~enwiki, Beastie Bot, Cydebot, AniMate, Osborne, Mbell, Spencer, Fractaloctal, WANAX, Altairisfar, Cynwolfe, Lucyin, LarsMarius, Doodledoo, CommonsDelinker, Idioma-bot, VolkovBot, Ryddarn, Liz de Quebec, BotanyBot, GirasoleDE, SieBot, Jrwagner, QualiaBot, Faradayplank, Harry~enwiki, IvanTortuga, De728631, ClueBot, Canis Lupus, PixelBot, Tdslk, BodhisattvaBot, SilvonenBot, MystBot, Addbot, Cuaxdon, LaaknorBot, Numbo3-bot, Flakinho, First Light, Luckas-bot, 2D, AnomieBOT, Xqbot, DSisyphBot, GrouchoBot, RibotBOT, Kobrabones, Pinethicket, Eroen, Ashkan P., Dinamik-bot, EmausBot, Look2See1, ZéroBot, Cjsunbird, Anonimski, Terraflorin, Morgan Riley, BG19bot, Vagobot, NotWith, Darorcilmir, Djukah, Dexbot, Trixie05, Impuls666666 and Anonymous: 32
- **Tilia** *Source:* http://en.wikipedia.org/wiki/Tilia?oldid=665315406 *Contributors:* Zundark, Amillar, Anthere, Heron, Olivier, Michael Hardy, Dominus, Yann, (, Greenman, Ahoerstemeier, Stan Shebs, Bogdangiusca, Andres, Dino, Ike9898, Imc, SEWilco, Nickshanks, Wiwaxia, Wetman, Shafei, Pollinator, Donarreiskoffer, Robbot, Kristof vt, Seglea, Naddy, Halibutt, UtherSRG, Dusik, DocWatson42, MPF, Wizzy, Wolfkeeper, Elinnea, Varlaam, Pne, JoJan, Danarmak, Andete, DanielCD, 4pq1injbok, Rich Farmbrough, Dbachmann, Mani1, CanisRufus, Ross-c, SquidInc, VonWoland, Rje, Pschemp, Hesperian, Merenta, Alansohn, Phyllis1753, Shoefly, Cmapm, BDD, Michael Gäbler, Stemonitis, Firsfron, Woohookitty, Richard Barlow, Taragui, Eleassar777, Dah31, GregorB, Isnow, Paxsimius, Rjwilmsi, Coemgenus, Саша Стефановић, Yamamoto Ichiro, Vuong Ngan Ha, FlaBot, Eubot, Hannu83, Chobot, Gdrbot, WriterHound, George Leung, RussBot, Petiatil, Chris Capoccia, RadioFan, Bloodofox, TDogg310, Lucasreddinger, Ormanbotanigi, Lindentree, Lt-wiki-bot, FrobozzElectric, A bit iffy, SmackBot, CJLippert, EncycloPetey, J budissin, BiT, Edgar181, Gilliam, Bluebot, Berton, PrimeHunter, Hibernian, Teodorico, FordPrefect42, Gruzd, Colonies Chris, Bruce Marlin, Sweetalkinguy, Jerry picker, NaySay, Usenetpostsdotcom, Spir, Kevmin, 16@r, Ruby miette, Peter Horn, SimonD, Ptelea, Ghughesarch, Nonpareil, Vanisaac, Lavateraguy, Erik Kennedy, Cydebot, Alvesgaspar, Sigo, TheJC, Rosser1954, Barticus88, Itsmejudith, Bob the Wikipedian, Escarbot, Milton Stanley, KP Botany, Salgueiro~enwiki, Jonnyboy5, Storkk, JAnDbot, Ericoides, Krasanen, Shumi1, Parsecboy, Dekimasu, Nyttend, Taamu, Philg88, Gwern, Slash, Johnbod, Bumper12, Ef3, Miskwito, Xyl 54, IceDragon64, Richard New Forest, Idioma-bot, VolkovBot, AlnoktaBOT, Martin451, Degutopia, Slysplace, Mzmadmike, Andy Dingley, Y, Synthebot, Jaguarlaser, Cnilep, Ponyo, Rob.bastholm, Jonas Poole, Fratrep, Leopold.lansing, JohnnyMrNinja, Kviall, Foglemark, Lascorz, SallyForth123, Me5000, The Thing That Should Not Be, Julesandjim, Drmies, Hafspajen, SGerbic, No such user, Wiki libs, LarryMorseDCOhio, Gikü, Tdslk, XLinkBot, BodhisattvaBot, Dthomsen8, Avoided, WikHead, Alansplodge, Anticipation of a New Lover's Arrival, The, Addbot, Guoguo12, Darwin-rover, The C of E, Numbo3-bot, Karduelis, EstendorLin, Yobot, TaBOT-zerem, Yngvadottir, AnomieBOT, KDS4444, DemocraticLuntz, JackieBot, Chrisr6937, Citation bot, Bob Burkhardt, MauritsBot, Xqbot, Gigemag76, Apuma, Skrod, Srich32977, Zmin inc, Cerniagigante, SPKirsch, Hamamelis, Thehelpfulbot, FrescoBot, D'ohBot, Doremo, Atlantia, 蒋龍, Leboite, Oldsingerman20, RedBot, Jandalhandler, Obscurasky, Seanwinstanley, FoxBot, Trappist the monk, IKnowsBetterIDoes, Dianelsmith, Catnip martini, Jynto, Rwood128, Esoglou, EmausBot, Leslieferreira, Look2See1, Yooooooop, Spookyland, Comesturnruler, ZéroBot, Matthewcgirling, Mayur, Donner60, PeterKneer, ClueBot NG, OhSoHeartless, Zeppa2, Helpful Pixie Bot, Akwago2, BG19bot, AvocatoBot, Matt Chase, Djihinne1, Skunk44, Darorcilmir, OlegTarabanov, JYBot, Ultra Venia, Sminthopsis84, Makecat-bot, Edfilmsuk, CorinneSD, Nalsenai, Corn cheese, Sowilō, DallasSchneider, Kayana Amos, Ginsuloft, Cbacken, Xanthomelanoussprog, MrScorch6200, Razorback74, Monkbot, Tymon.r, Sb2s3, KasparBot and Anonymous: 193
- **Tilia cordata** *Source:* http://en.wikipedia.org/wiki/Tilia_cordata?oldid=655620840 *Contributors:* Hephaestos, Yann, Jeandré du Toit, Imc, Wetman, Naddy, MPF, Gdr, JoJan, DanielCD, Mani1, Hesperian, Etxrge, Jeltz, Ghirlandajo, Kuohatti, Stemonitis, Rjwilmsi, FlaBot, Eubot, Hannu83, Gdrbot, YurikBot, RussBot, CambridgeBayWeather, Eleassar, Bota47, Jer ome, MalafayaBot, COMPFUNK2, Vinaiwbot~enwiki, Luke Harris, Ryulong, Ptelea, Kaarel, Erik Kennedy, Cydebot, DonBarton, Failfailfail, Thijs!bot, Nipisiquit, JAnDbot, MSBOT, Magioladitis, Ksvaughan2, CommonsDelinker, Athaenara, Stan J Klimas, Bumper12, VolkovBot, Steven J. Anderson, Andy Dingley, Jaguarlaser, Wavehunter, SieBot, BotMultichill, WikiBotas, ClueBot, Me5000, LarryMorseDCOhio, WooteleF, DumZiBoT, Thomani9, Addbot, LaaknorBot, AndersBot, The Vandal Warrior, Blokenearexeter, Zorrobot, Luckas-bot, Materialscientist, Arthur-

Bot, Xqbot, XZeroBot, Hrystiv, GrouchoBot, Peter Buch, LucienBOT, Archaeodontosaurus, Longrim, Primoz.eddie, MastiBot, Dukurs, Cnwilliams, Trappist the monk, EmausBot, WikitanvirBot, Rillke, ChuispastonBot, ClueBot NG, Ejensyd, BG19bot, Altaïr, NotWith, Mogism, 331dot, Lugia2453, Athenianepirote, Faizan, Lostprofeta, Monkbot, Arschiefer, Impuls666666, TypoKing and Anonymous: 41

- **Tilia platyphyllos** *Source:* http://en.wikipedia.org/wiki/Tilia_platyphyllos?oldid=645019031 *Contributors:* Imc, Pollinator, Robbot, Naddy, MPF, JoJan, DanielCD, Mani1, Hesperian, Stemonitis, Jean-Pol Grandmont, Eubot, Gdrbot, YurikBot, RussBot, Tavilis, Dysmorodrepanis~enwiki, SmackBot, Edgar181, Dreadstar, Ptelea, Cydebot, Barticus88, Sluzzelin, JAnDbot, Ksvaughan2, Faelomx, Bumper12, Idioma-bot, Steven J. Anderson, Penarc, Jaguarlaser, SieBot, Alexbot, Estirabot, LarryMorseDCOhio, Vegetator, MystBot, Addbot, Ssschhh, Zorrobot, Luckas-bot, Yobot, Ptbotgourou, El Grafo, Richigi, GrouchoBot, RibotBOT, D'ohBot, ZéroBot, Unused000705, MRAZ13, BattyBot, Darorcilmir, Impuls666666 and Anonymous: 15

- **Maple** *Source:* http://en.wikipedia.org/wiki/Maple?oldid=665714361 *Contributors:* AxelBoldt, Vicki Rosenzweig, Timo Honkasalo, Malcolm Farmer, Scipius, Christian List, PierreAbbat, William Avery, SimonP, Jaknouse, Ram-Man, DennisDaniels, Michael Hardy, Dan Koehl, (, Ahoerstemeier, Stan Shebs, Jebba, Nohat, Marshman, Imc, Saltine, Mp~enwiki, Wetman, Pollinator, Kdebisschop, Lumos3, PuzzletChung, Donarreiskoffer, Robbot, Nurg, M1shawhan, Ojigiri~enwiki, UtherSRG, Saforrest, Lupo, Zaui, Angilbas, Carnildo, MPF, Fennec, Tom harrison, Jfdwolff, Matt Crypto, Gadfium, Pgan002, Gdr, Gzuckier, Quadell, Bart Versieck, Antandrus, HorsePunchKid, JoJan, Sam, Ukexpat, Fg2, Mike Rosoft, Freakofnurture, DanielCD, Discospinster, ElTyrant, YUL89YYZ, Murtasa, Byrial, Paul August, ChristianR~enwiki, Closeapple, Pk2000, CanisRufus, E Pluribus Anthony redux, Zscout370, MBisanz, Mikcohen, Kwamikagami, Mwanner, Cacophony, Femto, Bobo192, Circeus, BrokenSegue, Nk, 3mta3, Obradovic Goran, Hesperian, Redf0x, MPerel, Haham hanuka, BlueNovember, Jumbuck, Jérôme, Alansohn, Atlant, Axl, Hu, Wtmitchell, Djlayton4, Velella, ClockworkSoul, Garzo, Mikeo, Gene Nygaard, Ceyockey, Adrian.benko, Richard Barlow, Spettro9, WadeSimMiser, AshishG, Schzmo, Isnow, Prashanthns, Dysepsion, Mandarax, BD2412, Rjwilmsi, P3Pp3r, Mfwills, SNIyer12, Vuong Ngan Ha, SchuminWeb, Latka, Margosbot~enwiki, Nivix, RexNL, Chobot, DVdm, Gdrbot, Gwernol, Wingchi, The Rambling Man, Sceptre, Stephenb, Tavilis, Thane, NawlinWiki, Wiki alf, Xyzzycoder, Brian Crawford, TDogg310, Zwobot, MakeChooChooGoNow, Quentin mcalmott, Zephalis, Rallette, Light current, Darcdante, Josh3580, JoanneB, CWenger, NeilN, GrinBot~enwiki, Luk, SmackBot, Brya, Reedy, KnowledgeOfSelf, Delldot, Hardyplants, Kintetsubuffalo, Rmx256, Gary2863, Yamaguchi 先生, Gilliam, Eug, Sir Spike, Chris the speller, Rkitko, DMS, DHN-bot~enwiki, Darth Panda, Gracenotes, Langbein Rise, Bruce Marlin, Onceler, Can't sleep, clown will eat me, VMS Mosaic, Edivorce, Flyguy649, TheLimbicOne, Ultor Solis, Bejnar, SirIsaacBrock, SashatoBot, Lambiam, Dcruz01, Rebelx24, Kevmin, Evenios, Ruby miette, Avs5221, Maksim L., Sharcho, Peter Horn, M@sk, Fredil Yupigo, Iridescent, Tailor70, Igoldste, Cbrown1023, GrahamBould, Courcelles, JayHenry, Tawkerbot2, SkyWalker, JForget, Lavateraguy, Pmyteh, Phanu9000, Baskaufs, NickW557, ShelfSkewed, Lazulilasher, Cydebot, Gogo Dodo, Red Director, Alaibot, Victoriaedwards, Greenboxed, Gimmetrow, Pontus Lindengren, Olegivvit~enwiki, Rymich13, Thijs!bot, Chiriones, Epbr123, The Captain Returns, Jaxsonjo, Mojo Hand, Ufwuct, MichaelMaggs, Escarbot, AntiVandalBot, Seaphoto, QuiteUnusual, KP Botany, Spencer, Salgueiro~enwiki, Storkk, Glass of water, Deadbeef, JAnDbot, Deflective, Husond, Barek, Quentar~enwiki, Jonemerson, ReignMan, Bongwarrior, VoABot II, Michael Goodyear, Sonknuck23, Fabrictramp, Cyktsui, Boffob, DerHexer, MartinBot, Stephanjo~enwiki, CommonsDelinker, Masebrock, Boston, J.delanoy, Trusilver, Rgoodermote, Athaenara, Chopin-Ate-Liszt!, Telewatho, BMA13, McSly, OAC, NewEnglandYankee, SJP, SriMesh, FJPB, Nadiatalent, Largoplazo, 2help, WJBscribe, Davecrosby uk, Idioma-bot, Lights, VolkovBot, ABF, Jeff G., Soliloquial, Cacolantern, Philip Trueman, Rdnckj258, TXiKiBoT, Technopat, NPrice, Fcb981, Kfinnigin, Melsaran, Slysplace, Seb az86556, Cremepuff222, Remilo, Joesmithjoesmithjoe, Synthebot, Elnok, Agüeybaná, Fuzzytnth3, Peter Fleet, Top caty, Johncf, Bfpage, SieBot, Coffee, Portalian, Jauerback, VVVBot, Gerakibot, Dawn Bard, Caltas, Sudox, Flyer22, LibStar, Oda Mari, JetLover, Aruton, Oxymoron83, Bagatelle, KoshVorlon, MookieZ, OKBot, Wuhwuzdat, Dragon panda from the west, Nn123645, Escape Orbit, ImageRemovalBot, Elassint, ClueBot, Ben stinebaugh, The Thing That Should Not Be, Shinpah1, SecretDisc, Andygusg, CptCutLess, Puchiko, Jersey emt, On Thermonuclear War, Seanwal111111, Jusdafax, Estirabot, Razorflame, Mikaey, Janeevans, Lx 121, Berean Hunter, David.cormier, Bearsona, Spitfire, BodhisattvaBot, Rror, Wikiuser100, Duncan, Evergreengal, Nepenthes, WikHead, SilvonenBot, Mifter, Undomelin, Addbot, Blanche of King's Lynn, AkhtaBot, Ronhjones, Vishnava, Veg grower, Download, NPChristmas, Bassbonerocks, Joren Six, West.andrew.g, 5 albert square, Numbo3-bot, Nervous65, Tide rolls, David0811, HerculeBot, Gammadia, Luckas-bot, 2D, Ptbotgourou, Fraggle81, TaBOT-zerem, Cflm001, Yiplop stick stop, Washburnmav, Worm That Turned, Synchronism, Andrewrp, 08glasgow08, Rjanag, IRP, Hmvont, Ulric1313, Flewis, Materialscientist, Maxis ftw, BoredWithNothingToDo, Neurolysis, LilHelpa, The Firewall, Xqbot, Sionus, Anna Frodesiak, Srich32977, Amqui, Bigmack2400, ئاسۆ, Yofish9, Brutaldeluxe, Samwb123, A.amitkumar, Dougofborg, Cesarqed, Recognizance, Dger, Tetraedycal, A little insignificant, DivineAlpha, Sistemu, Citation bot 1, Programmer13, Pinethicket, Micromesistius, Abductive, PrincessofLlyr, Bob250, Calmer Waters, Mapleowns23, Bambooowns24, Andymachloveswang, RedBot, Σ, Barras, December21st2012Freak, White Shadows, Kgrad, TobeBot, Jherbertz, Ccd4girl, Mjdestroyerofworlds, Reach Out to the Truth, St3ve4Lifez, Mean as custard, The Utahraptor, RjwilmsiBot, Jyoyopaek, Elliottarnett, Jackehammond, Monty carlo, EmausBot, Orphan Wiki, Ajraddatz, Stupidpokemon, Yt95, Yellowseven, Tommy2010, Wikipelli, Reddakid, Cuepro, Antigrandiose, Yourmother125912521, Sepbrown, SporkBot, Wayne Slam, Thine Antique Pen, GeorgeBarnick, Donner60, Appalachiantrail73, Peter Karlsen, Architect7, ClueBot NG, Kmilli, Cmrnbalzer24, This lousy T-shirt, Widr, Helpful Pixie Bot, ConcealMyIPAddress, Csepel21, Strike Eagle, Northamerica1000, Geraldo Perez, Verplay, Im Kwando, Washago99, BattyBot, Royboycoffeemug, Laurenmapletree, Gjones17, Lamppost123, MikeBaseGod, Ohonedirection, JHollman31, Alexcolepilkerton, Click at risk, Ches85, Telfordbuck, Callaway Hanson, AmaryllisGardener, Brendon.clemens, Tentinator, Haminoon, Majesticbutterking, Bautisam000, Laptopgurl, Ndrezner101, Ladacj, 1will11, Hdavies18794, Monkbot, Prisencolinensinainciusol, Bobby swainston, Julietdeltalima, BOBcheese69, FourViolas, Docsevo, Bananaqueer, I like apples 2001 and Anonymous: 524

- **Acer campestre** *Source:* http://en.wikipedia.org/wiki/Acer_campestre?oldid=661201424 *Contributors:* Silvonen, Topbanana, Robbot, Kristof vt, UtherSRG, Srtxg, MPF, JoJan, Closeapple, Circeus, Nicke Lilltroll~enwiki, Nk, Hesperian, HasharBot~enwiki, Jumbuck, Lectonar, Stemonitis, Rjwilmsi, Ricardo Carneiro Pires, Eubot, Gdrbot, YurikBot, RussBot, Eupator, BOT-Superzerocool, Ger-more, Hirudo, Cazort, Chris the speller, Kitzke, Salvor, MalafayaBot, Hibernian, Colonies Chris, Dcruz01, Ptelea, Cydebot, Casliber, Thijs!bot, Escarbot, JAnDbot, Geniac, Magioladitis, Boston, Wlodzimierz, Bumper12, Nadiatalent, Jackaranga, STBotD, VolkovBot, Philip Trueman, TXiKiBoT, SieBot, Oculi, SoxBot III, Addbot, Numbo3-bot, Zorrobot, Luckas-bot, Yobot, Materialscientist, Xqbot, Gigemag76, GrouchoBot, Galloramenu, RedBot, Mishae, RjwilmsiBot, EmausBot, Look2See1, Kmoksy, Matthewcgirling, عم رو بن لئ ثوم, NotWith, Darorcilmir, Dexbot, Trixie05, Stamptrader, Impuls666666, Otto Sheva2, Mmurali1 and Anonymous: 25

- **Oak** *Source:* http://en.wikipedia.org/wiki/Oak?oldid=666220879 *Contributors:* ClaudeMuncey, Mav, Manning Bartlett, Malcolm Farmer, Rizniz, Rgamble, Enchanter, PierreAbbat, William Avery, TomCerul, Zoe, Azhyd, Heron, Jaknouse, Quercusrobur, Olivier, Infrogmation, Dan Koehl, Liftarn, Deadstar, Ixfd64, Ellywa, Ahoerstemeier, Glenn, Bogdangiusca, Wnissen, Dmsar, Phr, Tjunier, Radiojon, Tpbradbury, Imc, Nv8200pa, SEWilco, Roehsler, David.Monniaux, Shafei, Palefire, Owen, Carlossuarez46, Robbot, Kristof vt, Moncrief, Altenmann, Romanm, Arkuat, Caknuck, UtherSRG, Srtxg, Fabiform, Giftlite, DocWatson42, MPF, Abigail-II, Tom harrison, Tom Radulovich, Ds13, Dick Bos, Guanaco, Critto~enwiki, Chowbok, Andycjp, Antandrus, Williamb, Kesac, Maximaximax, Icairns, Rel-

lis1067, Kevin Rector, Canterbury Tail, Andete, DanielCD, Discospinster, LegCircus, Guanabot, Vsmith, Bender235, Kwamikagami, Mwanner, QuartierLatin1968, Susvolans, RoyBoy, Stesmo, Sortior, Smalljim, Dungodung, Nk, Troels Nybo~enwiki, Hesperian, MPerel, HasharBot~enwiki, JustJuthan, Alansohn, Quatermass, Algirdas, Theodore Kloba, Snowolf, Wtmitchell, Djlayton4, Garzo, HenryLi, Kazvorpal, Feezo, Pekinensis, Woohookitty, Richard Barlow, Georgia guy, Jeff3000, Pixeltoo, Miss Madeline, Jean-Pol Grandmont, Kelisi, Schzmo, Wiggy!, Blisco, Jobnikon, BD2412, FreplySpang, Rjwilmsi, Astropithicus, Vagab, Ian Lancaster, Yamamoto Ichiro, FayssalF, Eubot, Andymadigan, Crazycomputers, AJR, Hottentot, Gemmabass, RexNL, Gurch, Schmerguls, CiaPan, CJLL Wright, Chobot, DaGizza, Gdrbot, VolatileChemical, YurikBot, Wavelength, Hairy Dude, FrenchIsAwesome, Pigman, Eupator, Jon Peli Oleaga, Igo4U, Aaron Walden, Stephenb, Wimt, Tavilis, ENeville, Grafen, Seegoon, Misza13, Zwobot, Aaron Schulz, Xompanthy, Lockesdonkey, Samir, Amphis, Asarelah, Tigershrike, Zzuuzz, Argo Navis, Alureiter, Katieh5584, Appleseed, Ajdebre, DVD R W, Myrabella, SmackBot, Amcbride, Unschool, Ex0pos, KnowledgeOfSelf, Pgk, Eventer, Eskimbot, Hardyplants, Onebravemonkey, MelancholieBot, HalfShadow, Yamaguchi 先生, Gilliam, Ohnoitsjamie, Kaiwen1, Skizzik, Rkitko, Ian13, Bjmullan, Melburnian, I7s, Deli nk, Andrej Šalov, Gsp8181, Can't sleep, clown will eat me, Shalom Yechiel, OrphanBot, Sommers, Snowmanradio, Lesnail, Addshore, Amazins490, Mermoz~enwiki, Wirbelwind, Lcarscad, Kotjze, SirIsaacBrock, The undertow, Scientizzle, J 1982, ML5, Mgiganteus1, Bjankuloski06, Archangel127, A. Parrot, Smith609, Bendzh, Maksim L., Waggers, Peter Horn, MTSbot~enwiki, Ginkgo100, Pauric, Nehrams2020, Iridescent, LadyofShalott, AGK, Maelor, Civil Engineer III, Tawkerbot2, Enginear, Alecsescu, JForget, Dgw, NickW557, Moreschi, Davnor, ArgentTurquoise, Gogo Dodo, Agne27, Optimist on the run, Throquzum, Daven200520, Victoriaedwards, Daniel Olsen, Rosser1954, Oxonhutch, Thijs!bot, Epbr123, Pstanton, Kablammo, Sagaciousuk, N5iln, Mojo Hand, Oliver202, Horologium, Edal, Z10x, Big Bird, RoboServien, Escarbot, Dainis, Ericjs, Darekun, AntiVandalBot, Luna Santin, Seaphoto, Emeraldcityserendipity, QuiteUnusual, Tchoutoye, Smartse, Harborsparrow, Nipisiquit, Storkk, AubreyEllenShomo, Helot, BeefRendang, Sluzzelin, Parande, JAnDbot, Deflective, Cantabwarrior, MER-C, Plantsurfer, Lionchow, Krasanen, 100110100, Snowolfd4, WolfmanSF, Bongwarrior, VoABot II, JNW, JamesBWatson, Steven Walling, 0x0n, Catgut, Daarznieks, 28421u2232nfenfcenc, Nat, Cpl Syx, DerHexer, Daemonic Kangaroo, Patstuart, Pere prlpz, MartinBot, Krosth~enwiki, Glossando, R'n'B, Vox Rationis, Alexnevzorov, Nono64, Brunch vs. breakfast, Fconaway, Tgeairn, J.delanoy, Trusilver, Love Krittaya, Uncle Dick, Acalamari, DarkFalls, Gordonmonaghan, Novis-M, Cognita, Bumper12, Plasticup, NewEnglandYankee, Hello i am a guy, Juliancolton, Kmanblue, Ginga123, Bonadea, Kinigi, Christopher.wright.2006, Rasgfsadgas, Xiahou, ThePointblank, CardinalDan, Richard New Forest, Idioma-bot, Spellcast, Ottershrew, Wordreader, VolkovBot, CWii, ABF, AlnoktaBOT, Philip Trueman, Yomammammammamifjuyigb, Nypr1nc355, TXiKiBoT, VivekVish, Carlangas, Anonymous Dissident, Historyexpert, Denseatoms, Hrothberht, Clarince63, Martin451, Leafyplant, LeaveSleaves, Snowonweb, Andrewrost3241981, Jeremy Bolwell, Maxim, Car utas, Falcon8765, Andygharvey, TommyMac71, Monty845, Nagy, Logan, Pruxo, Legoktm, NHRHS2010, Matt.t.martin, SkyViewOrphanage, Bfpage, SieBot, Tiddly Tom, Ellbeecee, Jauerback, Kodd, Camaranj, Krawi, Winchelsea, Dawn Bard, Caltas, Geniuskyle, Triwbe, SuzanneIAM, Matthew Brandon Yeager, Nelsondh, Happysailor, Flyer22, Alexbrn, Hobojoebob, Oda Mari, Buttons, Kay Körner~enwiki, JSpung, Allmightyduck, Koi-chan, Oxymoron83, Smilesfozwood, ShadowShift, Pymouss, Gift Of Ireland, COBot, Diego Grez, Privilegg, Ascidian, Denisarona, Richard David Ramsey, Lascorz, Martarius, ClueBot, Jchatter, GorillaWarfare, 4everboy, Jeffy666, Iliaorkin, Fyyer, The Thing That Should Not Be, Drmies, SuperHamster, AtSwimTwoBirds, Neverquick, Puchiko, Excirial, Filippakos, Northernhenge, Naleh, Lucas hersey9, Gulmammad, Vivio Testarossa, Lartoven, Arjayay, Razorflame, Starrystar849, RegalStar, Mikaey, Thingg, Aitias, Gejan, PCHS-NJROTC, Amaltheus, Columbiabotany, Kruusamägi, Johnuniq, SoxBot III, Tdslk, DumZiBoT, Skunkboy74, The Cool Kat, Terry J. Carter, Stickee, LindyJune, Skarebo, Coccionos, Catgirl, Beastbeastbeastzero, Joshnadler, BadProds, Addbot, Blanche of King's Lynn, Freakmighty, Zarcadia, CanadianLinuxUser, Hockey2008, NjardarBot, Jim10701, LaaknorBot, Glane23, Glass Sword, Favonian, Bencohoon, Blokenearexeter, Jasper Deng, West.andrew.g, Lemonade100, Cbz3000, Denicho, Numbo3-bot, Keds0, Erutuon, Tide rolls, Luckas Blade, Slgcat, Legobot, Luckas-bot, Yobot, TaBOT-zerem, Cflm001, Wotansohn, Boulevardier, THEN WHO WAS PHONE?, EnDaLeCoMpLeX, Synchronism, AnomieBOT, Andrewrp, Kerfuffler, Jim1138, Galoubet, JackieBot, Junkatunk, Piano non troppo, Bluerasberry, Materialscientist, 90 Auto, Citation bot, NinetyNineFennelSeeds, Paperandpaper, Smich31, ArthurBot, Quebec99, MauritsBot, Xqbot, Battyman0121, Slikeiscecks, Capricorn42, Hammersbach, Gigemag76, Khajidha, Sylwia Ufnalska, Eddy 1000, Srich32977, Linkywarrior, MGA73, Ani medjool, GrouchoBot, Hi man987654321, Prettymb, Gutterlok, RibotBOT, Xbt12x, Cresix, Amaury, Kursis, Brutaldeluxe, Hamamelis, Will coonass, FrescoBot, Santiago bronson, Weetoddid, Gourami Watcher, Citation bot 1, Peetlesnumber1, Pinethicket, I dream of horses, HRoestBot, Abductive, MJ94, Jcf0987, Slickwarrior11, RedBot, L8mare, Jauhienij, JodaCocorra, Abc518, Wayne Riddock, Kgrad, Mehrunes Dagon, TobeBot, Animalparty, ItsZippy, HoworHow, GB802, Jeffcraig, Davish Krail, Gold Five, CraigGoodall, DARTH SIDIOUS 2, TjBot, Elliottarnett, NerdyScienceDude, Rwood128, Kiko4564, Skamecrazy123, DASHBot, EmausBot, WikitanvirBot, Eekerz, Reycom026, Look2See1, Super48paul, LPSGiRL53, IncognitoErgoSum, RA0808, Frfdg12, Themanwhoisthespam, Wikipelli, K6ka, Jasonanaggie, Thecheesykid, Fæ, Nix Hansen, Tiffers1441, Gwrr, Medeis, A930913, Grauntgront, Wayne Slam, Ashie41399, Erianna, RaptureBot, EricWesBrown, Donner60, Puffin, Subrata Roy, Iceyleaf, ChuispastonBot, Peter Karlsen, Surreyboy84, DASHBotAV, Architect7, Spicemix, Bennissley, Berberisb, Bigbyrdbrain2, ClueBot NG, Gareth Griffith-Jones, Jack Greenmaven, Millermk, Cswdodge, Cntras, Braincricket, O.Koslowski, Jcschulze, Mtking, D521322a, Helpful Pixie Bot, Kr1st1deejay97, MirkoS18, Csepel21, ?oygul, Nintendostorm, Jamrine, FUCCK OSAMA BIN LADENN, Plantdrew, Lowercase sigmabot, BG19bot, Vagobot, Gomada, Zipzip50, Mark Arsten, Earth'sbuddy, Joydeep, Felicialws, HerpinDerper, Harizotoh9, Spekozols, Pijussau, Cheldavila, TracyK123, Minsbot, BallerHaller, Anbu121, Greilly16, Tankerlator, Venessachix, Kru2, Jojocalypso12345678, Spital8katz, Vanished user lt94ma34le12, Curritocurrito, Lamppost123, Bardrick, Oskoreii, Kman677, Dexbot, Lugia2453, Charlayy, Nomen ambiguum, HudsonH1, WhitleyTucker, The Anonymouse, Xxcatherine97xx, Solis5000, Drunken clam 5, Majesticbutterking, Mushroomtip4u, Lagoset, Fafnir1, Monkbot, CDrummond21, Bobbyjopy, The Gamer7726, Cleanbank, BritishHacker, Segtr, 7he Bomb, Wester4402, Ratli034, Icecream696969, Morelikesplz, Meglydiaa and Anonymous: 808

- **Quercus robur** *Source:* http://en.wikipedia.org/wiki/Quercus_robur?oldid=662826205 *Contributors:* Ram-Man, Dan Koehl, Ahoerstemeier, Muriel Gottrop~enwiki, Haabet, Andres, Ffransoo, Imc, Owen, Robbot, Pigsonthewing, Kristof vt, RedWolf, Naddy, MPF, Chowbok, CryptoDerk, Yath, JoJan, Eregli bob, OwenBlacker, B.d.mills, Swid, Billlion, Circeus, Hesperian, HasharBot~enwiki, Hippophaë~enwiki, Theodore Kloba, Djlayton4, SidP, Rjwilmsi, Panterka, Ev, FlaBot, Daderot, Eubot, Gdrbot, Roboto de Ajvol, YurikBot, RobotE, Phantomsteve, RussBot, Dysmorodrepanis~enwiki, Stefanst, Amphis, GrinBot~enwiki, SmackBot, NickShaforostoff, Rkitko, Hibernian, Snowmanradio, Lesnail, A. Parrot, Rybioko~enwiki, P-A., Kaarel, J Milburn, RCopple, Lavateraguy, Ræv, N2e, Flynnbar, LivingShadow, MC10, Ambo100, Rosser1954, JamesAM, Biruitorul, JustAGal, Iulius, Brianthegiant, Smartse, JAnDbot, Magioladitis, Fenitharbour, Soulbot, JPG-GR, R'n'B, Acalamari, Bot-Schafter, Wimox, Prot D, Idioma-bot, VolkovBot, Rei-bot, Patche99z, Jaguarlaser, Truthanado, EmxBot, SieBot, Halcionne, ClueBot, OlHen, Niceguyedc, Neumeiko~enwiki, MalcolmGould, Lokionly, Kubek15, Alansplodge, Joshnadler, Addbot, Leszek Jańczuk, MrOllie, Download, Blokenearexeter, LinkFA-Bot, Numbo3-bot, Luckas-bot, AnomieBOT, Burrows, DAFMM, ArthurBot, Printpost, Sylwia Ufnalska, Raysmh91, RibotBOT, Hamamelis, Longrim, I dream of horses, Metricmike, RedBot, MastiBot, Elektryczne jabłko, Horst-schlaemma, Dukurs, Seanwinstanley, Woodexpert, Lotje, Dinamik-bot, Aiurdin, Cmvito, Obsidian Soul, TjBot, EmausBot, Look2See1, Skauts, ZéroBot, Rcsprinter123, Aldnonymous, عم‌رو بن لل‌ث‌وم, CocuBot, PaleClouded-

White, MerlIwBot, Helpful Pixie Bot, Utar Sigmal, Shokatz, Dodshe, NotWith, Spekozols, Vassto, Jwrstewart, Maxronnersjo, Dexbot, Sminthopsis84, Ercé, KasparBot, BeastBoy3395 and Anonymous: 60

- **Quercus petraea** *Source:* http://en.wikipedia.org/wiki/Quercus_petraea?oldid=659019729 *Contributors:* William Avery, Imc, Owen, Robbot, Pigsonthewing, Kristof vt, Naddy, MPF, Gdr, OwenBlacker, Circeus, Dave.Dunford, Adrian.benko, Stemonitis, Eras-mus, FlaBot, Eubot, David.Gaya~enwiki, Hannu83, Gdrbot, YurikBot, RobotE, RussBot, SmackBot, Rkitko, Hibernian, Lesnail, Carnby, RCopple, Umedard, Flynnbar, Throquzum, Rosser1954, Thijs!bot, Barticus88, Smile a While, Smartse, JAnDbot, DuncanHill, Plantsurfer, Soulbot, JPG-GR, Idioma-bot, VolkovBot, TXiKiBoT, Andy Dingley, Jaguarlaser, SieBot, Fabullus, OlHen, Mild Bill Hiccup, Willow 05, Old.coastie, SilvonenBot, Addbot, Blokenearexeter, Kisbesbot, Zorrobot, Luckas-bot, Yobot, AnomieBOT, ArthurBot, Xqbot, Sylwia Ufnalska, SassoBot, Brutaldeluxe, Doremo, RedBot, Twistlethrop, Bodrugan, Ashkan P., Indie Gnoh, Tatianahinterreither, EmausBot, Look2See1, ZéroBot, Tolly4bolly, Rcsprinter123, Gareth Griffith-Jones, NotWith, Darorcilmir, Mortaza1234, Impuls666666 and Anonymous: 16

- **Pine** *Source:* http://en.wikipedia.org/wiki/Pine?oldid=666017723 *Contributors:* Bryan Derksen, Robert Merkel, XJaM, William Avery, Heron, Wshun, Liftarn, Menchi, Tannin, Tomi, Arpingstone, Ahoerstemeier, TUF-KAT, Jebba, Lupinoid, Glenn, RadRafe, Nikai, Andres, Smack, Hike395, Pm67nz, Tpbradbury, Marshman, Imc, Nv8200pa, VeryVerily, Phoebe, Bevo, AnonMoos, Pollinator, Hajor, Sewing, PuzzletChung, Donarreiskoffer, Seglea, UtherSRG, GerardM, Alan Liefting, DocWatson42, MPF, Elf, Abigail-II, Tom Radulovich, Everyking, Curps, Kenneth Alan, Prell, Joseph Dwayne, Wmahan, Gadfium, Nova, Yath, JoJan, Mike Rosoft, EugeneZelenko, Discospinster, Bedel23, Vsmith, LindsayH, Mani1, Wysiwyg~enwiki, Pk2000, Kwamikagami, Shanes, Bobo192, Circeus, Stesmo, Fir0002, Meggar, BrokenSegue, Pokrajac, Minghong, Nsaa, Geschichte, Alan Isherwood, Ranveig, Tavdy79, Alansohn, Gary, Improv, A.M.~enwiki, Wtmitchell, Velella, Super-Magician, Tainter, Netkinetic, Kazvorpal, Dan100, Mmxbass, BlueCanoe, Stemonitis, Ian Moody, Richard Barlow, Kelisi, Schzmo, TotoBaggins, Bluemoose, Isnow, TheAlphaWolf, Prashanthns, MarcoTolo, Rapty, Dysepsion, Mandarax, BD2412, Saperaud~enwiki, Rjwilmsi, SMC, BDerrly, RobertG, Vandal B, RexNL, Jrtayloriv, Journalis, DVdm, Gdrbot, Roboto de Ajvol, Wavelength, Sceptre, Lexi Marie, Qwertzy2, Stephenb, Barefootguru, Wimt, NawlinWiki, Dysmorodrepanis~enwiki, Astral, Jabencarsey, Irishguy, Matticus78, Alex43223, CLW, Zzuuzz, Yeltensic42, Gtdp, Closedmouth, Esprit15d, Petri Krohn, Peter, Anclation~enwiki, JLaTondre, Jonathan.s.kt, NeilN, SmackBot, Amcbride, Benjaminb, RedSpruce, Hardyplants, Virgilrm, Alsandro, TypoDotOrg, Yamaguchi 先生, UnqstnableTruth, Gilliam, Skizzik, Eug, Jeffsolodky, NewName, Bluebot, TheFeds, Langbein Rise, Ecoli, Salmar, Can't sleep, clown will eat me, Txinviolet, Chromatica, TheKMan, Rrburke, Claire van der Meer, Jiddisch~enwiki, Lcarscad, Sigma 7, Esrever, Soap, Rigadoun, Scientizzle, Kevmin, Mgiganteus1, Bjankuloski06, Cerowyn, IronGargoyle, A. Parrot, Julthep, Dicklyon, Martian.knight, Mattbucher, Peter Horn, Caiaffa, Alandlum, Paukrus, Gandalf1491, BranStark, Iridescent, CzarB, Paul venter, CapitalR, Courcelles, Tawkerbot2, Baqu11, Fvasconcellos, Wikipedi, Ale jrb, ClockFace, Sbn1984, FlyingToaster, Funnyfarmofdoom, Cydebot, Hikaru809, MC10, Nick Wilson, Gogo Dodo, Khatru2, DumbBOT, Daven200520, Omicronpersei8, Epbr123, N5iln, Mojo Hand, Marek69, John254, HelenKMarks, Massimo Macconi, DoomsDay349, Dzubint, AntiVandalBot, Luna Santin, QuiteUnusual, Bigtimepeace, Prolog, TimVickers, Lonestar662p3, LegitimateAndEvenCompelling, Dougher, Storkk, Res2216firestar, JAnDbot, Deflective, Leuko, MER-C, Plantsurfer, Robina Fox, Andonic, Acroterion, AprilMayJune, Moni3, Bongwarrior, VoABot II, VKing, Chevinki, Singularity, Twsx, Indon, Hotbaby angel 123, 28421u2232nfenfcenc, NoychoH, S3000, MartinBot, Church of emacs, Robheart, Camposanta, Linaduliban, Rettetast, AlexiusHoratius, Nono64, Hairchrm, Petter Bøckman, El0i, J.delanoy, Pharaoh of the Wizards, Floros, SU Linguist, McSly, Gurchzilla, Colchicum, Touch Of Light, Sophwozere2k6, Juliancolton, Cometstyles, Tatortats21, Burzmali, DorganBot, Million Moments, Goyston, CardinalDan, RJASE1, Idioma-bot, Lights, Deor, Jacroe, Vlmastra, Philip Trueman, Nikolaosp, TXiKiBoT, Burpen, Bookworm007, Drappel, Seb az86556, WabbyWabbyMabby, The pen man, Maksdo, Madhero88, Mage cat, Camanda, Drgoldmanthe1, Falcon8765, Turgan, Monty845, AlleborgoBot, Praefectorian, NHRHS2010, TheXenocide, Red, D. Recorder, HolyTemplar, Ponyo, Bfpage, Pare Mo, SieBot, Scarian, AWendt, Gerakibot, Mbz1, Caltas, Lucasbfrbot, Yintan, Calabraxthis, Bentogoa, Flyer22, Alexbrn, Oda Mari, Ablehr, Krithneel, Poopy890, Nickhender, Wombatcat, Bubblesnfudgelg, Oxymoron83, Faradayplank, Natbro703, Torchwoodwho, Maderibeyza, Mygerardromance, Church, ClueBot, Avenged Eightfold, GorillaWarfare, Servantofmankind, Murchy, Ideal gas equation, The Thing That Should Not Be, Tanglewood4, Drmies, Cp111, Fenwayguy, CounterVandalismBot, CptCutLess, Otolemur crassicaudatus, MickyCv900, Ktr101, Excirial, Jusdafax, PixelBot, Amytang, Lartoven, Jimmjimm7111, NuclearWarfare, Njardarlogar, Promethean, Mikaey, Thingg, Aitias, Flamker7, Pzoxicuvybtnrm, SoxBot III, DumZiBoT, Itsalllies, Joe joe1989, LittleBadJohn, Unreliableresource, MEANJOE123, Potatoman123, Amytang94, XLinkBot, Funfun101, Rror, Little Mountain 5, Avoided, Skarebo, WikHead, SilvonenBot, Alexius08, Noctibus, Airplaneman, HexaChord, Addbot, Some jerk on the Internet, Tsinoyman, Mlkday, Jojhutton, Atethnekos, Crazysane, Hottstuffbaby, Fieldday-sunday, MagnusA.Bot, CanadianLinuxUser, Fluffernutter, NjardarBot, Mentisock, Download, Morning277, Fabbodian, Sillyfolkboy, Mishu1985, Chzz, CUSENZA Mario, Favonian, West.andrew.g, 5 albert square, Thetomcruise, Numbo3-bot, Flakinho, Tide rolls, Lightbot, Dumass123, Krano, زرشک, ScAvenger, Lordofmodesty, مدحم عودة عطفى, David0811, Quantumobserver, Luckas-bot, Yobot, TaBOT-zerem, Kyle9988, II MusLiM HyBRiD II, Qwertt900, AnakngAraw, Eric-Wester, Banjohunter, Synchronism, Fodo96, AnomieBOT, DemocraticLuntz, NathanoNL, JackieBot, Piano non troppo, Isablidine, Materialscientist, RobertEves92, ImperatorExercitus, Frankenpuppy, Xqbot, NSK Nikolaos S. Karastathis, S h i v a (Visnu), Plumpurple, JimVC3, Gmodot, Ched, Nickshifrin, GrouchoBot, Hi man987654321, RibotBOT, Amaury, Brutaldeluxe, Doulos Christos, Ominous12, Bgagaga, Erik9, Samwb123, A.amitkumar, Scottw233, FrescoBot, Nicholaifanged, Iougamma, Matt408, Kitty catcat123, Karahara, Santiago bronson, Editorrr13, Hassangi69, Krish Dulal, Cdm1991, Pinethicket, I dream of horses, Chrispolicastro, HRoestBot, A8UDI, RedBot, Phearson, Sal.Jo, Meaghan, FoxBot, TobeBot, Zvn, Freddo09, Antipastor, Winnie890, Diannaa, Brian the Editor, Reach Out to the Truth, Minimac, Sideways713, DARTH SIDIOUS 2, MLuds, RjwilmsiBot, TjBot, Ripchip Bot, Okielina, Thiridaz, 919tswells, DASHBot, BandBHawks, EmausBot, John of Reading, WikitanvirBot, Bret5000, Immunize, Racerx11, RA0808, Hazzarington, Tommy2010, Winner 42, Wikipelli, Chiton magnificus, Elementaldragon3, JDDJS, Fæ, Abu Shawka, EdEColbert, Matthewcgirling, Kiwi128, Git2010, Wayne Slam, Ocaasi, Tolly4bolly, Jsayre64, JoeSperrazza, L Kensington, Donner60, ChuispastonBot, Ankuaqua, Sunshine4921, Architect7, JonRichfield, 123123123abcde, ClueBot NG, Whitneym11, Woodie01, Primergrey, Germain1234, Widr, سراجد سراجد امم, Theopolisme, Helpful Pixie Bot, Titodutta, Calabe1992, DBigXray, WNYY98, Rook666, Lowercase sigmabot, InformedMan, Hewhoamareismyself, Pine, Wasbeer, ISTB351, Wiki13, MusikAnimal, AvocatoBot, BlueSwede92, BPositive, Mmovchin, Man88, 10SatchellJ, Snow Blizzard, Ccevo2011, Annanilsson123, Darorcilmir, Supercooperduper, Eworld187, Mrt3366, The Illusive Man, Ngoquangduong, EuroCarGT, Miguel raul, Dexbot, Sharpfence, Lugia2453, Thestephen415, TheJoshy, SFK2, Josophie, UrbanDragon 33, Diptomite, SamX, Flat Out, Jr8825, Ufuos10, Giannird123, Brendanshan, Skodes, Ginsuloft, Cacacca123, Urbanshoester69, 1will11, Monkbot, BethNaught, Tomcjackc, QueenFan, WikiFloppers, Bigdickmick97, Leob123)87;)7));:.3:38, Ivyyoung, WikiGuy3422, Ninjapig24, Cinnamon&Chocolate, Daboss12321, Ipopey, Poo6869696699, Chachasuey and Anonymous: 855

- **Scots pine** *Source:* http://en.wikipedia.org/wiki/Scots_pine?oldid=665161297 *Contributors:* Malcolm Farmer, Ramin Nakisa, Tomi, Tiles, Synthetik, Jimfbleak, Ping, Ruhrjung, Hike395, Reinhard Kraasch, Marshman, Imc, Kenneð, Wetman, Kenneth Alansson, Naddy, MPF, Elf, Abigail-II, Varlaam, Jaan513, Bobblewik, Tipiac, Yath, Williamb, JoJan, Ukexpat, Adashiel, EugeneZelenko, Discospinster,

Solitude, Hydrox, Djordjes, Neko-chan, Robotje, Olve Utne, Nk, Hesperian, BDD, Ghirlandajo, BlueCanoe, Stemonitis, Andrea.gf, T34, Rjwilmsi, P3Pp3r, MZMcBride, Ricardo Carneiro Pires, Eubot, Javier martin, Vclaw, Gdrbot, WriterHound, Elminster~enwiki, Roboto de Ajvol, Kummi, Stephenb, Gaius Cornelius, Dysmorodrepanis~enwiki, Ragesoss, Epipelagic, BOT-Superzerocool, CLW, Orcaborealis, Mais oui!, West Virginian, Hardyplants, Rkitko, Nick4gwen, Hibernian, Langbein Rise, Bruce Marlin, Audriusa, Onorem, MrDarwin, J 1982, SilkTork, Ian Dalziel, Skinsmoke, Sasata, JMK, Paul venter, Kaarel, Nulb0ard, GrahamBould, CmdrObot, Miguel303xm~enwiki, Beastie Bot, Cydebot, Amandajm, Pinky sl, Casliber, Rosser1954, Thijs!bot, Osborne, Ufwuct, Brianthegiant, Obiwankenobi, Amberroom, JAnDbot, Krasanen, Leolaursen, Appraiser, Harristweed, Peter coxhead, Vicpeters, Ben MacDui, The Boy that time forgot, Reedy Bot, AvatarMN, Zosma, Colchicum, Ngc1982, Burzmali, Vanished user 39948282, DorganBot, HighKing, Idioma-bot, VolkovBot, Indubitably, Philip Trueman, TXiKiBoT, Modal Jig, Dch888, Eubulides, Jaguarlaser, SieBot, Elie plus, Qst, Kentynet, IvanTortuga, De728631, ClueBot, Mod.torrentrealm, Saddhiyama, Michael.Urban, Pplfichi, Bobby Tables, Tyler, Njardarlogar, Kruusamägi, DumZiBoT, Lord Uniscorn, SilvonenBot, Badgernet, Mabalu, Addbot, Chzz, First Light, Zorrobot, Luckas-bot, Yobot, Fraggle81, Retro00064, AnomieBOT, ArthurBot, Xqbot, K731, Raysmh91, Srich32977, RibotBOT, SassoBot, Gr5959, Benny White, Archaeodontosaurus, D'ohBot, Cargoking, Pikiwyn, Guitarmad101, Mishae, Derild4921, NerdyScienceDude, EmausBot, Look2See1, Rcsprinter123, ChuispastonBot, EdoBot, EllenHodges, عم‌رو بن لئ‌ثوم, ClueBot NG, PaleCloudedWhite, Primergrey, Helpful Pixie Bot, Gob Lofa, Plantdrew, PR Alma, Pine, EcoChap, Darorcilmir, Makecat-bot, Tentinator, ArmbrustBot, Zenibus, HalfGig, Monkbot, Impuls666666, Biblioworm, Asdqwertyasd and Anonymous: 93

- **Populus** *Source:* http://en.wikipedia.org/wiki/Populus?oldid=663188650 *Contributors:* Danny, PierreAbbat, Karen Johnson, Jaknouse, Olivier, Ahoerstemeier, Stan Shebs, Suisui, Harry Potter, Jonik, SEWilco, Pollinator, Owen, PuzzletChung, Kristof vt, UtherSRG, Saforrest, GerardM, Alan Liefting, MPF, Mintleaf~enwiki, Tom Radulovich, Peruvianllama, Andycjp, JoJan, Kelson, M1ss1ontomars2k4, DanielCD, Ma'ame Michu, Rich Farmbrough, Mani1, Bender235, Swid, Bobo192, Elipongo, Giraffedata, Nk, Alansohn, Chino, AnnaP, Atlant, Pippu d'Angelo, WikiParker, BDD, Ceyockey, BlueCanoe, Woohookitty, Richard Barlow, John Hill, Graham87, BD2412, David Levy, Crolidge, Vuong Ngan Ha, FlaBot, Eubot, Margosbot~enwiki, Gareth E Kegg, Chobot, Gdrbot, YurikBot, Mongol, Gaius Cornelius, NawlinWiki, ENeville, Dysmorodrepanis~enwiki, Rbarreira, Jpbowen, Bobak, RL0919, TDogg310, EEMIV, DeadEyeArrow, Lucky number 49, IceCreamAntisocial, Wknight94, LeonardoRob0t, Thomas Blomberg, Biddlesby, SmackBot, TestPilot, Rkitko, Melburnian, Gruzd, Bruce Marlin, Can't sleep, clown will eat me, Valfontis, IronGargoyle, Bendzh, Peter Horn, MTSbot~enwiki, Igoldste, Hdroute-wikipedia@yahoo.com, Caliga10, Pinky sl, Thijs!bot, Epbr123, Escarbot, Smartse, JAnDbot, Deflective, Maias, Freshacconci, RMN, Soulbot, Web-Crawling Stickler, Philg88, Drm310, Flowanda, P00r, Gustavus53, Anaxial, Wlodzimierz, Mdrmd, Mike.lifeguard, Johnbod, DarwinPeacock, Supuhstar, Bumper12, Nadiatalent, KylieTastic, Mdvaden, Idioma-bot, VolkovBot, Johan1298~enwiki, AlnoktaBOT, TXiKiBoT, Rei-bot, Someguy1221, Beyond silence, Mijter, Uannis~enwiki, Stupidplonker, Neparis, Kbrose, SieBot, ToePeu.bot, Gerakibot, Colfer2, Lightmouse, Dmodderman, Pinkadelica, Lascorz, ClueBot, Incrediblehunk, The Thing That Should Not Be, Mild Bill Hiccup, Dylan620, Smcquade99, Cirt, No such user, Mutton333~enwiki, StefG320, DerBorg, Amaltheus, Iftikhor, Wikiuser100, Avoided, Addbot, Darrylh08, Jim10701, Favonian, SamatBot, Lightbot, Legobot, Luckas-bot, Yobot, JackieBot, Jo3sampl, Twilding, Citation bot, ArthurBot, Obersachsebot, Xqbot, J04n, GrouchoBot, RibotBOT, Doulos Christos, StageGull, FrescoBot, Dger, Citation bot 1, Þjóðólfr, AstaBOTh15, Aninterestingfact~enwiki, Pzrmd, RedBot, Picturepocket, Noblelino, FoxBot, TobeBot, Thomas.caldwell, Kamaldevjhalli, RjwilmsiBot, TjBot, EmausBot, Acather96, WikitanvirBot, Look2See1, Comesturnruler, ZéroBot, Wayne Slam, Thine Antique Pen, Bonzo's Minsion, ClueBot NG, MerlIwBot, Helpful Pixie Bot, AvocatoBot, Snow Blizzard, EuroCarGT, JYBot, Dexbot, Eyesnore, Ginsuloft, Mattia480ac, Biblioworm, Some Gadget Geek, Bu180, KasparBot and Anonymous: 118
- **Populus tremula** *Source:* http://en.wikipedia.org/wiki/Populus_tremula?oldid=662721727 *Contributors:* Mykdavies, MPF, Juzeris, Stemonitis, BillC, MGTom, Angusmclellan, Eubot, Dj Capricorn, Ytrottier, Orcaborealis, Thomas Blomberg, EncycloPetey, Rkitko, Audriusa, JMK, Rosarinagazo, Iulius, JAnDbot, Gcm, MER-C, Peter coxhead, Wlodzimierz, TyrS, Bumper12, Nadiatalent, Idioma-bot, VolkovBot, TXiKiBoT, Seb az86556, Synthebot, The Red Hat of Pat Ferrick, Cygnis insignis, SchreiberBike, Addbot, Kisbesbot, Numbo3-bot, Luckas-bot, Yobot, 2D, AnomieBOT, MidnightBlueMan, RibotBOT, Santăr, Þjóðólfr, Abductive, Pzrmd, Noommos, EmausBot, WikitanvirBot, Look2See1, ZéroBot, Rcsprinter123, ChuispastonBot, Darorcilmir, Mogism, Trixie05, Impuls666666, KasparBot and Anonymous: 12
- **Populus nigra** *Source:* http://en.wikipedia.org/wiki/Populus_nigra?oldid=650512654 *Contributors:* Jallan, Owen, Pigsonthewing, MPF, Jaan513, JoJan, Karl-Henner, DanielCD, Xezbeth, Swid, Remuel, Nk, Jumbuck, Alansohn, Wtmitchell, Stemonitis, Andrea.gf, Rjwilmsi, FlaBot, Eubot, Gdrbot, YurikBot, Wavelength, Eupator, Dysmorodrepanis~enwiki, TDogg310, Bota47, Alsandro, Rkitko, AntonBryl, Bjankuloski06en~enwiki, Sibadd, Rosser1954, Chill doubt, TyrS, Bumper12, Nadiatalent, STBotD, DorganBot, HighKing, Richard New Forest, VolkovBot, TXiKiBoT, Beyond silence, Dick Shane, PGWG, SieBot, Elie plus, Lascorz, ClueBot, Addbot, LatitudeBot, AndersBot, Lightbot, Zorrobot, Luckas-bot, Materialscientist, ArthurBot, Xqbot, RibotBOT, AstaBOTh15, George Chernilevsky, Pinethicket, Abductive, Jauhienij, TobeBot, TjBot, Alph Bot, WikitanvirBot, ZéroBot, Erianna, عم‌رو بن لئ‌ثوم, MerlIwBot, Zollo9999, BattyBot, Dexbot, Impuls666666, Kuzujuk, Bu180 and Anonymous: 19
- **Rowan** *Source:* http://en.wikipedia.org/wiki/Rowan?oldid=665830230 *Contributors:* Hajhouse, Rmhermen, Gabbe, Angela, Julesd, Salsa Shark, IMSoP, Cimon Avaro, Jonik, Ehn, Dcoetzee, Dysprosia, Peregrine981, Marshman, Imc, Morwen, SEWilco, Bevo, Khym Chanur, Wetman, Francs2000, Donarreiskoffer, Vidyadhara, WormRunner, Nurg, GerardM, Anthony, BigSmoke, MPF, Gtrmp, Mintleaf~enwiki, Wiglaf, Brequinda, Gdr, Quadell, JoJan, Karl-Henner, Chmod007, DanielCD, Dbachmann, Corvun, Foolip, CanisRufus, Shanes, Kgaughan, Leftmostcat, Peter Greenwell, Circeus, Sam Korn, Alansohn, Etxrge, Anthony Appleyard, Velella, DrGaellon, Ghirlandajo, Stemonitis, Angr, Woohookitty, Richard Barlow, PoccilScript, Maryna Ravioli, Amikeco, TheAlphaWolf, Rangeley, Iitk, Eirikr, Pationl, Ketiltrout, Panterka, Nandesuka, Eubot, Tagesk, Gdrbot, Bgwhite, The Rambling Man, Ecemaml, RussBot, Stephenb, CambridgeBayWeather, Curtis Clark, Complainer, Bloodofox, Rmky87, Silverchemist, Jkelly, Mike Selinker, Orcaborealis, Mais oui!, JDspeeder1, Bibliomaniac15, SmackBot, Dappelquist, RlyehRising, Bluebot, Rkitko, Dr bab, Gruzd, Nap~enwiki, Bruce Marlin, Addshore, Abrahami, 4hodmt, ThurnerRupert, DavidCooke, Kevmin, Headzred, Kevin W., JForget, Lavateraguy, Orderinchaos, Baskaufs, Fordmadoxfraud, Icek~enwiki, Themightyquill, Cydebot, Gogo Dodo, Vanished User jdksfajlasd, Olegivvit~enwiki, Rosser1954, Pepperbeast, Oliver202, Poe Joe, Visik, Mentifisto, AntiVandalBot, Ririana, Luna Santin, Brendandh, Storkk, ShadowKinght, Plantsurfer, Arch dude, Krasanen, Magioladitis, Pedro, Murgh, Berig, DancingPenguin, LiverpoolCommander, Archolman, R'n'B, Grblundell, J.delanoy, Iaberis, Herbythyme, Seithiennyn, (jarbarf), Bumper12, Richard D. LeCour, Nadiatalent, Bonadea, Xenonice, TeamZissou, Alabasterarchangel, Strichek, Steven J. Anderson, Cantiorix, Softlavender, Tony221268, Nagy, Bennet34, Diyforlife, Flippityflop, NastalgicCam, ClueBot, Snigbrook, Eeno11, The Thing That Should Not Be, Muscari, Dylan620, Grey Matter, Smundy, WikHead, Gifford Watkins, Landon1980, Proxima Centauri, Grubel, MauriceM3, Glane23, Issyl0, ZX81, Yobot, 2D, AnomieBOT, Cottonapple4, Ferox Seneca, Hamamelis, Dger, Micromesistius, Calmer Waters, Fearfackta, Train-Uchiha, Uniwizard83, Sinazita, Kingsburyr, SporkBot, Zen Cyfarwydd, Rcsprinter123, GermanJoe, Sven Manguard, Manytexts, ClueBot NG, TheBlair2, DaveWIKI, Jeff1776, Crazymonkey1123, MerlIwBot, HMSSolent, Curb Chain, Plantdrew, BG19bot, Frze, Joydeep, FiverFan65, Mysterious Whisper, Mogism, Lugia2453, Krakkos, DeviantSerpent, Alyshkalia, Eugen

Hamerle, Monochrome Monitor, Tortie tude, Ardalazzagal, Riversid, Paige Ellen and Anonymous: 161

- **Whitebeam** *Source:* http://en.wikipedia.org/wiki/Whitebeam?oldid=636579318 *Contributors:* William Avery, Nonenmac, TeunSpaans, Jdforrester, Wetman, Seglea, MPF, Wiglaf, Zinnmann, DanielCD, CanisRufus, Nickj, Circeus, Etxrge, Giano, Stemonitis, Richard Barlow, TheAlphaWolf, Gimboid13, FlaBot, Eubot, MacRusgail, Gdrbot, YurikBot, Rmky87, Mike Selinker, SmackBot, Rkitko, Nbarth, Kevmin, Robofish, Ptelea, Lavateraguy, Cydebot, Visik, Smartse, JAnDbot, Sophie means wisdom, Krasanen, Nadiatalent, AlleborgoBot, Pointillist, Addbot, Erutuon, Yobot, Cottonapple4, Hamamelis, Slobodan Grasic, Micromesistius, Malcomsbridge, EmausBot, Gaffer206, ZéroBot, SporkBot, MerlIwBot, Plantdrew, Darorcilmir and Anonymous: 12

- **Sorbus aucuparia** *Source:* http://en.wikipedia.org/wiki/Sorbus_aucuparia?oldid=660925084 *Contributors:* Edward, Pekkapihlajasaari, Angela, Charles Matthews, Tris2000, Imc, Centrx, MPF, ALE!, Xezbeth, Dbachmann, Shenme, Velella, Stemonitis, Rjwilmsi, Eubot, Eleassar, Dysmorodrepanis~enwiki, Juanpdp, West Virginian, Bluebot, Rkitko, Kevmin, CmdrObot, ShelfSkewed, Idiotoff, Rosarinagazo, Visik, Plantsurfer, Natureguy1980, Lucyin, Hekerui, Peter coxhead, Bumper12, Nadiatalent, Idioma-bot, VolkovBot, TXiKiBoT, Fraxinus Croat, SieBot, Da Joe, QualiaBot, SamuelTheGhost, SilvonenBot, Felix Folio Secundus, Addbot, Proxima Centauri, LaaknorBot, Thomas Bjørkan, WikiDreamer Bot, Luckas-bot, Yobot, KamikazeBot, Cottonapple4, GrouchoBot, RibotBOT, Hamamelis, PigFlu Oink, Þjóðólfr, DrilBot, Pinethicket, Abductive, TobeBot, Dinamik-bot, RjwilmsiBot, EmausBot, John of Reading, WikitanvirBot, Look2See1, SporkBot, Zen Cyfarwydd, Anonimski, Sminthopsis84, Mogism, Cerabot~enwiki, KatelynEpp, ArmbrustBot, Impuls666666, Teuchy and Anonymous: 28

- **Sorbus aria** *Source:* http://en.wikipedia.org/wiki/Sorbus_aria?oldid=660041931 *Contributors:* Andres, Xezbeth, BerndH, Eubot, Dj Capricorn, SmackBot, Rkitko, Kevmin, Thijs!bot, Arthursilva, Visik, JAnDbot, Krasanen, Bumper12, Nadiatalent, Ryan shell, Elie plus, Yerpo, Addbot, Blokenearexeter, Numbo3-bot, Julia W, KamikazeBot, Collieuk, ArthurBot, Xqbot, GrouchoBot, RibotBOT, LucienBOT, DiHri, WikitanvirBot, ZéroBot, SporkBot, عم‌رو بن لئ‌ثوم, BG19bot, Makecat-bot, Joseph Laferriere and Anonymous: 6

- **Sorbus domestica** *Source:* http://en.wikipedia.org/wiki/Sorbus_domestica?oldid=655496647 *Contributors:* Eugene van der Pijll, Phil Boswell, MPF, DanielCD, CanisRufus, Circeus, Keenan Pepper, Cvalda, Chilepine~enwiki, Stemonitis, SP-KP, Eubot, OpenToppedBus, Gdrbot, Bgwhite, RobotE, NTBot~enwiki, RussBot, Badagnani, Wknight94, LeonardoRob0t, Garion96, SmackBot, EncycloPetey, Rkitko, Lindar, J.-H. Janßen, Aroundthewayboy, Kevmin, Reverendlinux, Dontworry, JoeBot, Alaibot, Mrazm, Mojo Hand, Sobreira, Escarbot, JAnDbot, Bumper12, Nadiatalent, VolkovBot, Hrdousek, Fraxinus Croat, QualiaBot, Estirabot, Addbot, Freemasonx, Lightbot, Luckas-bot, Yobot, Ptbotgourou, Cottonapple4, Xqbot, Almabot, GrouchoBot, LucienBOT, Ashot Gabrielyan, EmausBot, ZéroBot, Mirzeth, عم‌رو بن لئ‌ثوم, CarloMartinelli, Torvalu4, YFdyh-bot, Rybec, Vít Hrdoušek and Anonymous: 22

- **Sorbus torminalis** *Source:* http://en.wikipedia.org/wiki/Sorbus_torminalis?oldid=643954235 *Contributors:* Ellywa, Imc, MPF, Solipsist, Foobar, Karl-Henner, DanielCD, Syp, CanisRufus, Rosenzweig, Brookie, Krash, Eubot, Gdrbot, YurikBot, Wfried, RussBot, That Guy, From That Show!, SmackBot, Isaacwatts, Rkitko, MalafayaBot, Bruce Marlin, J.-H. Janßen, Kevmin, JoeBot, Andyrew609, Thijs!bot, Barticus88, Faigl.ladislav, Visik, JAnDbot, Krasanen, JaGa, DancingPenguin, Nadiatalent, VolkovBot, Martinevans123, Sevela.p, Tiddly Tom, Elie plus, QualiaBot, Addbot, Thgladde, AndersBot, SpBot, مانى, Luckas-bot, DisillusionedBitterAndKnackered, Cottonapple4, Robertito1965, Xqbot, RibotBOT, Izvora, LucienBOT, RedBot, TobeBot, Reaper Eternal, EmausBot, SporkBot, Spicemix, عم‌رو بن لئ‌ثوم, Helpful Pixie Bot, Sminthopsis84, Jamesx12345, Rybec, L.parrot, 115ash and Anonymous: 15

- **Willow** *Source:* http://en.wikipedia.org/wiki/Willow?oldid=665887499 *Contributors:* Robert Merkel, Tarquin, Nonenmac, Heron, Montrealais, Paul A, Stan Shebs, CatherineMunro, Jdforrester, Bogdangiusca, Andres, Jiang, Jonik, Hike395, Uriber, Przepla, Geary, Imc, Tero~enwiki, SEWilco, Gentgeen, Robbot, Babbage, Meelar, UtherSRG, Alan Liefting, Lysy, Bob Palin, MPF, Tom harrison, Napa, Yath, Gzuckier, JoJan, MisfitToys, Kusunose, Eregli bob, PDH, Icairns, Trevor MacInnis, DanielCD, Chris j wood, Discospinster, Vsmith, Xezbeth, Sietse Snel, RoyBoy, Thunderbrand, Quercus, Bobo192, Yongxinge, Duk, Bbartlog, Cavrdg, Haham hanuka, Alansohn, Anthony Appleyard, Mo0, Snowolf, Wtmitchell, Velella, Pontus, Aka, Tony Sidaway, T1980, Bsadowski1, Computerjoe, Kazvorpal, Ceyockey, Dismas, Stemonitis, Sandover, Woohookitty, Richard Barlow, Kelisi, Schzmo, Amikeco, GregorB, Isnow, GregL, Prashanthns, Graham87, Deltabeignet, BD2412, Mendaliv, Kls0, Rjwilmsi, Mick gold, Heah, Raprat0, Vuong Ngan Ha, Wragge, RexNL, Stormwatch, Codex Sinaiticus, Antilived, Gdrbot, VolatileChemical, WriterHound, YurikBot, RussBot, Carl T, Mikesegeln, Takwish, Stephenb, Pseudomonas, Wimt, Tavilis, Alynna Kasmira, Curtis Clark, Dysmorodrepanis~enwiki, Wiki alf, Voyevoda, Mikeblas, TDogg310, Misza13, Alex43223, IceCreamAntisocial, Tonywalton, Kelovy, Mike Serfas, Veli pohjonen~enwiki, Lt-wiki-bot, Closedmouth, Spawn Man, HereToHelp, DisambigBot, Fastifex, Zvika, Mejor Los Indios, SmackBot, Michaelll, Eskimbot, Gilliam, Hmains, Rkitko, Thumperward, MalafayaBot, Sadads, Bruce Marlin, Can't sleep, clown will eat me, Parent5446, Jiddisch~enwiki, DMacks, Pilotguy, Kukini, SashatoBot, Meryt, Dmh~enwiki, Coasttocoast, U-571, KenFehling, J 1982, TheNeon, Kevmin, Bjankuloski06en~enwiki, Gnoll110, Jgrahn, Peter Horn, KJS77, BranStark, Paul venter, Shoeofdeath, Bajamircea, Sander Säde, Igoldste, Rwst, JayHenry, Fooladin, JForget, Porterjoh, Higgins146, Baskaufs, Neelix, WillowW, Gogo Dodo, Jaerik, Rosser1954, Thijs!bot, Interested2, James086, Pcbene, Nick Number, Dawnseeker2000, Natalie Erin, Aaron7chicago, AntiVandalBot, Earrach, North Shoreman, Spencer, Storkk, Figma, Res2216firestar, JAnDbot, Barek, Arch dude, Sigurd Dragon Slayer, Krasanen, Easchiff, Bongwarrior, VoABot II, Redaktor, Nyttend, Aka042, 28421u2232nfenfcenc, DerHexer, Philg88, BeadleB, Boston, Hummerh2, J.delanoy, Bot-Schafter, Katalaveno, Eric in SF, Grmanners, Ajtruhan, Juliancolton, IceDragon64, DASonnenfeld, Richard New Forest, Idioma-bot, Funandtrvl, I really want to go to the bathroom, Rodolph, VolkovBot, AlnoktaBOT, Soliloquial, Philip Trueman, TXiKiBoT, HalanTul, Technopat, Louiseann76, Anna Lincoln, Matahari Pagi, Crispy park, Wavehunter, AlleborgoBot, PericlesofAthens, EmxBot, Ernest lk lam, SieBot, Calliopejen1, Elie plus, BCB, Arda Xi, Alexbrn, SPACKlick, Techman224, Lorance2, UB65, Lord Opeth, Graminophile, Troy 07, Soporaeternus, SlackerMom, ClueBot, Incrediblehunk, The Thing That Should Not Be, DruryLaneLondon, Skaterk318, Nickforster, Hopescotch, Munich55gmn, Weepy Wilbur, Sfwithy, NuclearWarfare, Arjayay, SchreiberBike, Dwbruhn, Dylan38, Footballfan190, Versus22, Amaltheus, MaxSem on AWB wheels, Spitfire, Gwandoya, Oldekop, Avoided, SilvonenBot, Badgernet, Alansplodge, Ismailzali, Millskelly1, Addbot, ERK, Landon1980, Matthew Gibson, Tanhabot, CarsracBot, Favonian, CarTick, West.andrew.g, Numbo3-bot, Tide rolls, Zorrobot, Frehley, Ben Ben, Middayexpress, Luckas-bot, Yobot, Luce nordica, TaBOT-zerem, Amirobot, Death Jester4, AnomieBOT, Andrewrp, DemocraticLuntz, Jim1138, Accuruss, Tom87020, Jaloka, Elostirion, Materialscientist, Citation bot, Xqbot, Blogman222, Weepingraf, Gigemag76, Zq977, DSisyphBot, Anna Frodesiak, Tyrol5, Control.valve, Inferno, Lord of Penguins, GrouchoBot, Abce2, Melelaswe, Hamamelis, Telescoper, FrescoBot, Fortdj33, L7tr4h, Robert Matthews, Dger, VI, Craig Pemberton, Aab298347927384, OgreBot, Citation bot 1, Pinethicket, Edderso, Willownona, Pzrmd, Trybush, VenomousConcept, FoxBot, Mehrunes Dagon, TobeBot, Lotje, BenjPHolm, Brambleclawx, DARTH SIDIOUS 2, RjwilmsiBot, Ripchip Bot, Grondemar, Goldenluigi, EmausBot, Quanyinsdottir, Sumsum2010, Faolin42, Wikipelli, IAmGoingToEatYouAlive, John Cline, Abu Shawka, Elektrik Shoos, Kombatwombats, Monterey Bay, Rcsprinter123, Missy Sunshine, Banana326, Subrata Roy, Xairoo, ChuispastonBot, Sunshine4921, Darrellw100, Aryanire, Spicemix, ClueBot NG, Cwmhiraeth, Mjanja, Raghith, Hectonichus, Motheus9, Muon, CaroleHenson, Chamber6, Widr, Helpful Pixie Bot, Orun Kabir, Gob Lofa, Plantdrew, Walk&check, SidKane, Jaraccounts, Bartowj, Kokomo98, Bob Re-born, Qwekiop147, MathewTownsend, OMFGAnotherTroll1,

Hayk S, BattyBot, Justincheng12345-bot, Darorcilmir, Sminthopsis84, Maximun1243, Pokajanje, CorinneSD, WillowTH, Iztwoz, Eyesnore, Willowxx, Ichooxu, Sennenjo, Arder1, Ginsuloft, Library Guy, Andrew J.Kurbiko, OnTheMountainTop, Bali88, Monkbot, Vozul, Wwefan2136, Jacobminor, KasparBot, Benedrylcumberbabe, Δρύωψ and Anonymous: 385

- **Salix pentandra** *Source:* http://en.wikipedia.org/wiki/Salix_pentandra?oldid=600279808 *Contributors:* MPF, Etxrge, SteinbDJ, RyanGerbil10, Stemonitis, Vary, Eubot, Gdrbot, Dj Capricorn, YurikBot, LeonardoRob0t, Mmcannis, NorthernFire, Rkitko, WeggeBot, Idioma-bot, VolkovBot, Tlustulimu, Addbot, Luckas-bot, Gigemag76, GreenZmiy, Pzrmd, Jauhienij, EmausBot, Kmoksy, ZéroBot, ChuispastonBot, Impuls666666 and Anonymous: 4
- **Salix fragilis** *Source:* http://en.wikipedia.org/wiki/Salix_fragilis?oldid=622339839 *Contributors:* Jonik, Naddy, UtherSRG, Alan Liefting, MPF, Andris, JoJan, DanielCD, RyanGerbil10, Stemonitis, Eubot, Gdrbot, YurikBot, RussBot, Zwobot, Ormanbotanigi, Mmcannis, West Virginian, Jacek Kendysz, Chris the speller, Rkitko, Croquant, Robofish, Aka042, HighKing, Idioma-bot, VolkovBot, Qgroom, Neparis, Wjefferson, Dthomsen8, SilvonenBot, MystBot, Addbot, Zorrobot, Luckas-bot, Yobot, ArthurBot, Gigemag76, Epp, Pzrmd, Coekon, EmausBot, WikitanvirBot, Look2See1, Utar Sigmal, ArmbrustBot, Impuls666666 and Anonymous: 11
- **Salix alba** *Source:* http://en.wikipedia.org/wiki/Salix_alba?oldid=662640910 *Contributors:* Michael Hardy, GTBacchus, Stan Shebs, Palfrey, Jonik, Imc, Naddy, UtherSRG, MPF, Everyking, JoJan, One Salient Oversight, Austin Hair, DanielCD, Caeruleancentaur, Etxrge, Galaxiaad, RyanGerbil10, Stemonitis, Pixeltoo, Schzmo, Frankie1969, Rjwilmsi, Ricardo Carneiro Pires, FlaBot, Eubot, Codex Sinaiticus, Gdrbot, Dj Capricorn, YurikBot, Huw Powell, RussBot, Eupator, Badagnani, Mmcannis, SmackBot, Rkitko, SMP, The Rogue Penguin, BostonMA, Drphilharmonic, CmdrObot, W guice, Thijs!bot, Nick Number, Vhorvat, JAnDbot, Txomin, Soulbot, Pharaoh of the Wizards, Useight, Idioma-bot, VolkovBot, ABF, Dqeswn, Somanypeople, TXiKiBoT, Steven J. Anderson, Jaguarlaser, AlleborgoBot, Neparis, Elie plus, WRK, Mygerardromance, De728631, Estirabot, DumZiBoT, Dthomsen8, Addbot, Annielogue, AkhtaBot, Latitude-Bot, Luckas-bot, Yobot, AnomieBOT, Götz, ArthurBot, Xqbot, Weepingraf, Gigemag76, RibotBOT, Hamamelis, HRoestBot, Pzrmd, RedBot, Ashkan P., Researcher5678, EmausBot, WikitanvirBot, Look2See1, ZéroBot, ClueBot NG, Regulov, Northamerica1000, AvocatoBot, Darorcilmir, Arwel ap Dewi ap Siôn, Clr324, Sudhindra007, Impuls666666, Neatsfoot, Fbl1962, Tovasor, Alisha Rodriguez, Mmbeasley and Anonymous: 31
- **Salix triandra** *Source:* http://en.wikipedia.org/wiki/Salix_triandra?oldid=637429376 *Contributors:* MPF, PFHLai, Stemonitis, Eubot, Dj Capricorn, Ytrottier, Mmcannis, Rkitko, Cydebot, Thijs!bot, Masebrock, Idioma-bot, VolkovBot, Martinevans123, Tlustulimu, Alexbot, Addbot, Zorrobot, Gigemag76, GreenZmiy, Pzrmd, EmausBot, Look2See1, Kmoksy, ZéroBot, BG19bot, Impuls666666 and Anonymous: 1
- **Taxaceae** *Source:* http://en.wikipedia.org/wiki/Taxaceae?oldid=600676769 *Contributors:* Nonenmac, Heron, Erik Zachte, Kku, Menchi, GTBacchus, Glenn, Marshman, Robbot, UtherSRG, MPF, JoJan, DanielZM, Rich Farmbrough, Kwamikagami, Bontenbal, Nk, Hesperian, Vuong Ngan Ha, Chobot, Gdrbot, YurikBot, RobotE, Peter G Werner, Ormanbotanigi, CLW, Unyoyega, J. Finkelstein, Kevmin, WeggeBot, Hydro, .anacondabot, MartinBot, Idioma-bot, Shindo9Hikaru, SieBot, Namazu-tron, Cantor, Addbot, Proxima Centauri, Flakinho, Luckas-bot, Amirobot, AnomieBOT, Hunnjazal, ArthurBot, Xqbot, Stho002, Viceroy Bob, PigFlu Oink, Bilbo571, J.Dong820, Mogism, SamX and Anonymous: 17
- **Taxus baccata** *Source:* http://en.wikipedia.org/wiki/Taxus_baccata?oldid=662534353 *Contributors:* Ewen, Llywrch, Rl, Imc, Ccady, Wetman, Donarreiskoffer, Robbot, Alan Liefting, MPF, Michael Devore, Varlaam, Jfdwolff, JoJan, Discospinster, Rich Farmbrough, Kostja, Dbachmann, Mani1, Andrejj, Jnestorius, Syp, Pjf, Smalljim, Reinyday, Goblim, Vortexrealm, Hesperian, Alansohn, Hippophaë~enwiki, Velella, BlueCanoe, Stemonitis, Andrea.gf, Blacktav, Ricardo Carneiro Pires, Johnrpenner, Eubot, Quuxplusone, Daycd, Gdrbot, Bgwhite, YurikBot, Wavelength, RussBot, Curtis Clark, TDogg310, Ormanbotanigi, Kortoso, Bota47, Grayson, KGasso, Altjira, Orcaborealis, LeonardoRob0t, Nsevs, Gaudio, Friman~enwiki, SmackBot, Brya, McGeddon, Jagged 85, Eventer, Stephanie pegg, Commander Keane bot, Gilliam, Hmains, Rkitko, Snori, Greatgavini, SundarBot, Grover cleveland, James M Barlow, Only, Tesseran, Crouchbk, Erimus, Anlace, Attys, Dcruz01, J. Finkelstein, Fuzzbox, Ian Dalziel, Ravenloft, Peter Horn, WahreJakob, Zh1yong, CmdrObot, Ballista, Richard Keatinge, Beastie Bot, Cydebot, Gogo Dodo, Ambo100, Casliber, Oxonhutch, Thijs!bot, Epbr123, Osborne, Steve Dufour, Colin Rowat, Nick Number, AntiVandalBot, KP Botany, Smartse, JAnDbot, Plantsurfer, Tadramgo, Appraiser, Nyttend, Hekerui, Berig, Ultramarinblau1969, Myrkkyhammas, B9 hummingbird hovering, Paracel63, Ben MacDui, R'n'B, Vox Rationis, Nono64, Masebrock, Tgeairn, Wlodzimierz, C.R.Selvakumar, DogNewTricks, Pardonmadame, Notreallydavid, John Tierney, Belovedfreak, Nwbeeson, Grey Maiden, Idioma-bot, X!, VolkovBot, Bacchus87, Philip Trueman, Kostaki mou, TXiKiBoT, Jalwikip, Kww, Vipinhari, Anonymous Dissident, Crocadillion, Jaguarlaser, SieBot, Janeleah, VVVBot, Phe-bot, Revent, Gerald Hogan, Ken123BOT, Graminophile, ClueBot, Czarkoff, DrFO.Jr.Tn~enwiki, Blanchardb, Grandpallama, Estirabot, Carriearchdale, SMTBSI, Versus22, Slayerteez, Pixixi, Ldbio130, BarretB, Jed 20012, Bvcde, HarlandQPitt, Alansplodge, Airplaneman, Snortymean, Tonsky, Addbot, Aceofhearts1968, Proxima Centauri, PRL42, Lightbot, Legobot, Luckas-bot, Yobot, Ptbotgourou, Jack5150, Jdeb901, Gerixau, Richigi, AnomieBOT, Nortmannus, Jikkal, Maniadis, Xqbot, Zad68, Pontificalibus, Aragon121212125, Airascada, J04n, GrouchoBot, Diplogkop, Arthropod, Kak Dela?, Benny White, Ritenice, FrescoBot, Yardang, Codwangler, Archaeodontosaurus, Solaricon, Krish Dulal, Pinethicket, Arctic Night, Akkida, Lineslarge, Xune07, TobeBot, Jaba1977, Mramz88, Yoyo9990, Editor XXV, Alistair45, EmausBot, Jdy17, Look2See1, Super48paul, Tommy2010, Jjcisneros, Matthewcgirling, Yew Logz Ftw, Earedelf123, Rasada Incogneta, Rcsprinter123, Ταsουλα, Djapa84, Michaelandsandy, ChuispastonBot, ClueBot NG, PaleCloudedWhite, Ficatus, ArboreallyProcessed, Costesseyboy, Widr, Helpful Pixie Bot, Dayvey, Ugncreative Usergname, Solistide, Darorcilmir, Curritocurrito, Khazar2, Roboticman, Roboticracman, RotlinkBot, Reatlas, Scott Pringle Trotter, Hazelares, Mondiad, Jayaguru-Shishya, Johnegbert1995, *thing goes, Monkbot, Impuls666666, EarthWindAndPeaceYall, Snagglepuss88, Rygarris, Ewright17, Sarr Cat, Rosswhelan96 and Anonymous: 169
- **Shrub** *Source:* http://en.wikipedia.org/wiki/Shrub?oldid=664584302 *Contributors:* Vicki Rosenzweig, Tarquin, PierreAbbat, Karen Johnson, Sean, Anthere, Rcingham, Jaknouse, Mintguy, Sfdan, Tedernst, Michael Hardy, Dominus, Tannin, Ixfd64, Stan Shebs, Angela, Glenn, Jschwa1, Jiang, Qwert, Dmsar, Fuzheado, Wik, Imc, Rei, Wiwaxia, Fvw, Raul654, Wetman, Finlay McWalter, Carlossuarez46, Sewing, Robbot, Kristof vt, Hemanshu, Hadal, UtherSRG, GerardM, Wereon, Lupo, Carnildo, Fabiform, MPF, Tom Radulovich, Everyking, Gilgamesh~enwiki, Alensha, Gzornenplatz, Utcursch, JoJan, MacGyverMagic, Kesac, Daniel11, Joyous!, Dcandeto, Fanghong~enwiki, DanielCD, Rhobite, Guanabot, Vsmith, Kooo, Nabla, Syp, Marco255, Shanes, Bobo192, Rje, DCEdwards1966, Hesperian, Voyager, Alansohn, Craigy144, Hippophaë~enwiki, Mysdaao, RainbowOfLight, Freyr, Versageek, Markaci, Chilepine~enwiki, Rocastelo, Jpers36, GlaucusAtlanticus, SP-KP, BenSamples, Knuckles, GregorB, Mb1000, Radiant!, Marudubshinki, Dysepsion, King of Hearts (old account 2), David Levy, Edison, Canderson7, Wahoofive, Guyd, Yamamoto Ichiro, CR85747, Latka, Margosbot~enwiki, RexNL, Gurch, Born2cycle, Mhking, Dj Capricorn, Wavelength, JarrahTree, Stephenb, CambridgeBayWeather, Pseudomonas, Ritchy, NawlinWiki, Curtis Clark, Dysmorodrepanis~enwiki, Grafen, Misza13, Wolfling, IceCreamAntisocial, Open2universe, Jwissick, BorgQueen, Katieh5584, DVD R W, Vanka5, SmackBot, Brya, KnowledgeOfSelf, SearedIce, Edgar181, Srnec, Ohnoitsjamie, Chris the speller,

Bluebot, Jprg1966, SB Johnny, Liamdaly620, PrimeHunter, Domthedude001, Baa, MaxSem, Rrburke, Decltype, EdGl, Where, Vriullop, Scientizzle, J 1982, Heimstern, Robofish, Bjankuloski06en~enwiki, IronGargoyle, Bendzh, Jose77, Iridescent, Shoeofdeath, Ivan-Lanin, Courcelles, Woodshed, WeggeBot, Steel, Gogo Dodo, Kazubon~enwiki, Tawkerbot4, DavidRF, Bramlet Abercrombie, Dyanega, JamesAM, Epbr123, Mojo Hand, Nick Number, Eiffelle, Dzubint, AntiVandalBot, Majorly, Widefox, Joon1, SummerPhD, JAnDbot, Hut 8.5, Magioladitis, Bongwarrior, VoABot II, JamesBWatson, Michael Goodyear, Abhoffman, Allstarecho, MartinBot, Vicpeters, Linford585, Mschel, CommonsDelinker, Nono64, Tgeairn, Wlodzimierz, J.delanoy, MitchellHSmith, DrKiernan, AstroHurricane001, Uncle Dick, WarthogDemon, FLJuJitsu, Icseaturtles, Acalamari, NewEnglandYankee, Lizzy2656, Nadiatalent, KylieTastic, Treisijs, Sillybear25, Idioma-bot, VolkovBot, Jeff G., TXiKiBoT, Gwib, Vipinhari, Chrisbarrett87, Technopat, Una Smith, Jackfork, Retro990, Ilyushka88, Katimawan2005, Xavcam, Billinghurst, Dromio05, ZooZooBabBabBab3, AlleborgoBot, Abellina, SieBot, Ethel Aardvark, Avayak, Kakemann~enwiki, Dawn Bard, The way, the truth, and the light, Sunny910910, Flyer22, Aspects, E-nanu, Correogsk, SpartanJames, Jons63, EmanWilm, Kieranmc, Yofoosuckit2348973459082345-987234895749-8, TheCatalyst31, Elassint, ClueBot, Fribbler, GorillaWarfare, Noobschoolbusninja, The Thing That Should Not Be, Wysprgr2005, SuperHamster, Bsguenoun, Bellatrix Kerrigan, Estirabot, Ra1d3drsfan92, Masterg52, ChrisHodgesUK, La Pianista, Vegetator, Dana boomer, Berean Hunter, SoxBot III, Little Mountain 5, Skarebo, Addbot, Proofreader77, Detgf4, Some jerk on the Internet, Starzgirl, CanadianLinuxUser, Cokeaine, Glane23, Numbo3-bot, Tide rolls, Jan eissfeldt, Mjquinn id, Legobot, Luckas-bot, Intothewoods29, Arsenal1996, Sarrus, Gabby on Goodyears, DemocraticLuntz, AUG, A More Perfect Onion, Unara, Materialscientist, Sudhir Kumar87, Arctic Fox, Hahaurdead12, Maxis ftw, .أحمد.غامدي24, Pkravchenko, Xqbot, Alcon179, Reiven7913, Wperdue, Shock9191, Patluvsbawls823, NFD9001, Ruy Pugliesi, J04n, GrouchoBot, Chris.urs-o, Bellerophon, Queen57, Doulos Christos, Pug275, Shadowjams, E0steven, HaleybobIII, Verybadperson, Peteos, Hmay01, DivineAlpha, Pinethicket, HRoestBot, Me63636363, Timtots, Rushbugled13, Tinton5, Momaboy, Habali4ev23, A8UDI, Uiopqwerty987123, December21st2012Freak, Sportsfan922, TobeBot, Animalparty, Therandomthingfrommars, Dark Lord of the Sith, Dinamik-bot, Tgoodwil, Reaper Eternal, Banana warrior, Maxlaker11, Maxlaker1111, Bigsalvijc, NerdyScienceDude, EmausBot, WikitanvirBot, Look2See1, Itsmylover, Tommy2010, Wikipelli, Dcirovic, K6ka, ZéroBot, John Cline, Daniel coyle 96, KuduIO, Dodgerzfan, Git2010, Ihatemayonnaise, Megalonis, OnePt618, Isarra, Asdfghjuyt, ChuispastonBot, GAHDSG, Sven Manguard, Clumsy and stupid, Rocketrod1960, JonRichfield, E. Fokker, ClueBot NG, Cosmo9950, BOMBINI, Allen0431, م‌ح‌م‌د‌ع‌ل‌ی ب‌خ‌ت‌ی‌اری, Kendede, Tmarquese, Helpful Pixie Bot, Strike Eagle, Plantdrew, Dmalkin, The Banner Turbo, MusikAnimal, Numskull212, Ross7651, Noobsidevour, Turnt up 101, Sminthopsis84, 67shrub, Katelyn.kitzinger, EditorPharaoh, RainCity471, OccultZone, Coreyemotela, DudeWithAFeud, A.Minkowiski, Boyboy4444, Richard Yin, Sophayaaaa, Julietdeltalima, George Double You Bush, Heorge W. Bush, Racoon374638764876253, KasparBot, Awalk01, Misterfmdeeznuts, Ragax and Anonymous: 285

- **Rhamnus frangula** *Source:* http://en.wikipedia.org/wiki/Rhamnus_frangula?oldid=652810920 *Contributors:* Zundark, Robbot, Matthias5, Stemonitis, Woohookitty, Koavf, Eubot, Vlad, IceCreamAntisocial, Wknight94, SmackBot, EncycloPetey, Hmains, Rkitko, Gruzd, Abrahami, Dabean, Jedudedek, Anthony Bradbury, Cydebot, Thijs!bot, Hoffmeier, Peter coxhead, Bumper12, Idioma-bot, SieBot, Jvs, Ivan-Tortuga, Addbot, Death-n-l, SpBot, Karduelis, Romanskolduns, HerculeBot, DK4, Luckas-bot, KamikazeBot, Rubinbot, Jay L09, Xqbot, Dr CyCoe, Riventree, RedBot, Mohamadian, Gdisanto, Jonkerz, EmausBot, Look2See1, ZéroBot, ChuispastonBot, Noym, NotWith, Sminthopsis84 and Anonymous: 11

- **Rhamnus cathartica** *Source:* http://en.wikipedia.org/wiki/Rhamnus_cathartica?oldid=653730620 *Contributors:* Nonenmac, Goethean, MPF, Wiki-uk, Matthias5, BlueCanoe, Stemonitis, Rjwilmsi, Eubot, IceCreamAntisocial, Alexandrov, West Virginian, Hmains, Rkitko, Deli nk, Ferhengvan, Cydebot, PKT, JamesAM, Shirt58, JAnDbot, Soulbot, CommonsDelinker, Enuja, Bumper12, Nadiatalent, Idioma-bot, VolkovBot, TXiKiBoT, Moogwrench, AlleborgoBot, Dreamafter, Elie plus, Aillema, LeoFrank, MartinFields, Arjayay, Dougatwiki, Addbot, Polinizador, Tmccay, DK4, KamikazeBot, ArthurBot, Xqbot, Termininja, GrouchoBot, Dr CyCoe, DrilBot, Pinethicket, Micromesistius, TobeBot, RjwilmsiBot, Weimeml, EmausBot, Look2See1, Wikipelli, ClueBot NG, Ncassida, Rhamnus cathartica, Ontarioinvasiveplants, Sminthopsis84, Frosty, Ercé, ArmbrustBot, Monkbot, Buckthorn Buster and Anonymous: 20

- **Sambucus nigra** *Source:* http://en.wikipedia.org/wiki/Sambucus_nigra?oldid=660201287 *Contributors:* Nonenmac, Imc, Phil Boswell, Robbot, MPF, Rich Farmbrough, Horsten, Hesperian, Stemonitis, Woohookitty, Rjwilmsi, Ricardo Carneiro Pires, Tommy Kronkvist, Lebha, Eubot, Michaelschmatz, Hiding, Bgwhite, Chris Capoccia, Eleassar, Badagnani, IceCreamAntisocial, LeonardoRob0t, SmackBot, Michaelll, Wakuran, Rkitko, MalafayaBot, Hibernian, Droll, Mrarfarf, Abrahami, Idran, Beetstra, Iridescent, Alecsescu, IronChris, Lavateraguy, Icek~enwiki, Cydebot, Rosser1954, Thijs!bot, Osborne, Escarbot, Smartse, JAnDbot, Koibeatu, Ali 27, Wiki wiki1, R'n'B, Pharaoh of the Wizards, Colchicum, Sugarbat, Idioma-bot, Ccrinbama, TXiKiBoT, LeaveSleaves, Jaguarlaser, SieBot, Gerakibot, QualiaBot, Cppgx, ClueBot, PixelBot, Advaughan, SchreiberBike, Qwfp, XLinkBot, Thebossrooster, Alansplodge, Addbot, Heavenlyblue, Cuaxdon, Kingsix6878, م‌انـي, First Light, Bermicourt, Luckas-bot, Yobot, Christoffre, Push the button, AnomieBOT, Xqbot, Interocitor, Apothecia, Anna Frodesiak, Sambucol, Kou07kou, Hamamelis, Doremo, Pinethicket, Calmer Waters, Lb.at.wiki, Jonkerz, TjBot, EmausBot, John of Reading, WikitanvirBot, Look2See1, Auró, AvicBot, ZéroBot, Rillke, ع‌م‌رو ب‌ـن ل‌ل‌ث‌وم, Plantdrew, Hedgewizard, BG19bot, Hansiewansie, Darorcilmir, JYBot, Mysterious Whisper, 舒天, G.ferry, Monkbot, Impuls666666, Dluzader, Sdscholten, Ferrer.UCDavis, Tommiboshart and Anonymous: 47

- **Cornus sanguinea** *Source:* http://en.wikipedia.org/wiki/Cornus_sanguinea?oldid=659704689 *Contributors:* Lumos3, MPF, Jaan513, Hesperian, Stemonitis, Rjwilmsi, Eubot, Gdrbot, Dysmorodrepanis~enwiki, Argo Navis, Neelix, Escarbot, JAnDbot, Bumper12, Richard New Forest, VolkovBot, SieBot, Wikiuser100, Addbot, Culmensis, Yobot, Xqbot, RibotBOT, Esteis, Pinethicket, Tsinfandel, Ashkan P., EmausBot, Thecheesykid, ZéroBot, Ionutp, Mentibot, Plantdrew, AvocatoBot, BattyBot, ZorglubAB, ChrisGualtieri, AzseicsoK, E.klos, Impuls666666 and Anonymous: 9

- **Sorbus rupicola** *Source:* http://en.wikipedia.org/wiki/Sorbus_rupicola?oldid=656545040 *Contributors:* Xezbeth, Rjwilmsi, Kevmin, Lavateraguy, Peter coxhead, De728631, Addbot, Collieuk, Citation bot, Xqbot, LucienBOT, Robert Matthews, Citation bot 1, SporkBot, ع‌م‌رو ب‌ـن ل‌ل‌ث‌وم, BG19bot, Monkbot and Anonymous: 1

- **Hippophae rhamnoides** *Source:* http://en.wikipedia.org/wiki/Hippophae_rhamnoides?oldid=645469604 *Contributors:* Ewen, Kaihsu, Jnestorius, Dave.Dunford, Stemonitis, Rjwilmsi, Eubot, WriterHound, Chris Capoccia, Asarelah, SmackBot, Pdaoust, Rkitko, Deli nk, Gruzd, Peter Horn, CmdrObot, Harej bot, Escarbot, JAnDbot, DuncanHill, Magioladitis, Nono64, Wlodzimierz, DokX~enwiki, Edgeweyes, J Dezman, Bumper12, Nadiatalent, Burkhard.Plache, Idioma-bot, Speciate, Signalhead, VolkovBot, TXiKiBoT, Martin451, Synthebot, Jaguarlaser, SieBot, Niceguyedc, Luisvalenzuela2, Addbot, Cuaxdon, Varcis, Zorrobot, Luckas-bot, AnomieBOT, Citation bot, RibotBOT, Krish Dulal, EmausBot, ChuispastonBot, Spicemix, Michael Bailes, Proton02, Vagobot, Darorcilmir, Coralinepraz, Impuls666666 and Anonymous: 23

- **Euonymus europaeus** *Source:* http://en.wikipedia.org/wiki/Euonymus_europaeus?oldid=656278766 *Contributors:* Nonenmac, Imc, Lumos3, Mervyn, MPF, Haeleth, Wzwz, D6, Stemonitis, BillC, Eubot, Gdrbot, YurikBot, RobotE, Grafen, IceCreamAntisocial, Alx bio,

Edgar181, Chris the speller, Rkitko, Hibernian, BWDuncan, Thijs!bot, Sluzzelin, JAnDbot, PhilKnight, Thegreenj, Bumper12, Idioma-bot, Jaguarlaser, SieBot, Cewvero, Addbot, Download, Flakinho, Luckas-bot, AnomieBOT, Xqbot, GrouchoBot, Ripchip Bot, EmausBot, WikitanvirBot, ZéroBot, عمرو بن لئ‌ثوم, Hectonichus, Darorcilmir, Jondavguy, Impuls666666 and Anonymous: 10

- **Salix caprea** *Source:* http://en.wikipedia.org/wiki/Salix_caprea?oldid=649562634 *Contributors:* Ellywa, Stan Shebs, Jonik, Morwen, Robbot, Naddy, Meelar, Hadal, UtherSRG, Kent Wang, MPF, Jaan513, BozMo, JoJan, DanielCD, Cnyborg, Jumbuck, RyanGerbil10, Kenyon, Stemonitis, Philthecow, Richard Barlow, FlaBot, Eubot, CiaPan, Gdrbot, YurikBot, Sceptre, RussBot, Dysmorodrepanis~enwiki, Zwobot, Ormanbotanigi, Andrewbot, Mmcannis, Hraefen, Rkitko, Jóna Þórunn, MTSbot~enwiki, Dontworry, CmdrObot, Ies~enwiki, Abeg92, Lancsalot, Ambo100, Rosser1954, Thijs!bot, Storkk, JAnDbot, Some thing, PhilKnight, Englishmajor07, Alpha mushi, Nono64, MishaPan, VolkovBot, Tomer T, TXiKiBoT, SieBot, Addbot, NjardarBot, BepBot, Luckas-bot, Julia W, ArthurBot, Weepingraf, Gigemag76, Clowdi, RibotBOT, GreenZmiy, Archaeodontosaurus, PigFlu Oink, Pzrmd, FoxBot, Lotje, Miracle Pen, Ashot Gabrielyan, EmausBot, ClueBot NG, Impuls666666, Mrinc46 and Anonymous: 23
- **Salix cinerea** *Source:* http://en.wikipedia.org/wiki/Salix_cinerea?oldid=657229182 *Contributors:* Kku, Bogdangiusca, Eugene van der Pijll, Academic Challenger, Alan Liefting, MPF, Stemonitis, T34, Eubot, YurikBot, Dysmorodrepanis~enwiki, Mmcannis, Rkitko, MalafayaBot, Rosser1954, Thijs!bot, Krasanen, MartinBot, Hans Dunkelberg, Kazu89, Bumper12, Idioma-bot, VolkovBot, Beyond silence, BCB, Hafspajen, Law & Disorder, Addbot, CarsracBot, Zorrobot, Luckas-bot, ArthurBot, Gigemag76, GrouchoBot, GreenZmiy, PigFlu Oink, Pzrmd, EmausBot, WikitanvirBot, ClueBot NG, Vagobot, Ocotea, Kim Karlsson Moritz (SLU), Impuls666666 and Anonymous: 8
- **Salix purpurea** *Source:* http://en.wikipedia.org/wiki/Salix_purpurea?oldid=648224908 *Contributors:* Jonik, Naddy, Hadal, MPF, Andris, JoJan, DanielCD, Sten, Inge-Lyubov, RyanGerbil10, Stemonitis, Ricardo Carneiro Pires, Crizz, Eubot, Gdrbot, YurikBot, Dysmorodrepanis~enwiki, Mmcannis, Rkitko, Croquant, Peter coxhead, Wlodzimierz, Idioma-bot, VolkovBot, Lascorz, MystBot, Addbot, WikiDreamer Bot, Gigemag76, GrouchoBot, GreenZmiy, Pzrmd, EmausBot, ZéroBot, ChuispastonBot, Vagobot, Mk.mayankchaudhary, Impuls666666 and Anonymous: 4
- **Salix viminalis** *Source:* http://en.wikipedia.org/wiki/Salix_viminalis?oldid=600279663 *Contributors:* MPF, JoJan, DanielCD, Xezbeth, CanisRufus, Nk, RyanGerbil10, Stemonitis, Eubot, Gdrbot, YurikBot, RussBot, Dysmorodrepanis~enwiki, Mmcannis, SmackBot, Rkitko, Croquant, Jóna Þórunn, Usenetpostsdotcom, Kaarel, LCKuhn, Neelix, Vhorvat, Idioma-bot, VolkovBot, SieBot, ElMeBot, Addbot, First Light, Yobot, Ptbotgourou, Gigemag76, FrescoBot, GreenZmiy, Mezod, Pzrmd, EmausBot, Look2See1, ChuispastonBot, Teraflorin, AfadsBad, Impuls666666 and Anonymous: 7
- **Salix aurita** *Source:* http://en.wikipedia.org/wiki/Salix_aurita?oldid=581213023 *Contributors:* Stemonitis, Mmcannis, Rkitko, Rosser1954, Ilyaroz, KBYU, Alexbot, LarryMorseDCOhio, MystBot, Addbot, Zorrobot, ArthurBot, LilHelpa, Gigemag76, GrouchoBot, BenzolBot, Pzrmd, EmausBot, WikitanvirBot, ZéroBot, Nature Protector, ChrisGualtieri and Anonymous: 1
- **Viburnum opulus** *Source:* http://en.wikipedia.org/wiki/Viburnum_opulus?oldid=662743102 *Contributors:* Zundark, Ronz, Imc, Gidonb, Lzur, MPF, Telsa, Sonjaaa, PDH, Skarg, Hesperian, Stemonitis, Ricardo Carneiro Pires, Eubot, Gdrbot, YurikBot, Nineteenthly, Apokryltaros, Ormanbotanigi, Gadget850, SmackBot, Nickst, Hardyplants, Skizzik, Rkitko, Nillerdk, Yulia Romero, MTSbot~enwiki, Paukrus, Kaarel, Lavateraguy, Legaia, Cydebot, Thijs!bot, Tiggrx, Lucyin, Peter coxhead, Mylabrie, Aleksandr Grigoryev, Bumper12, Colchicum, Wakaba.girl, TXiKiBoT, Jaguarlaser, SieBot, WereSpielChequers, Wutsje, TubeWorld, Alexbot, Addbot, Cuaxdon, LinkFABot, Luckas-bot, Yobot, Ptbotgourou, AnomieBOT, Xqbot, Capricorn42, Hamamelis, LucienBOT, Longrim, Dinamik-bot, Vovchyck, Look2See1, Cymru.lass, Diako1971, عمرو بن لئ‌ثوم, CocuBot, ArielMartian, NotWith, Darorcilmir, ChrisGualtieri, Dexbot, Mtaylor733, Nightphoenix90, KasparBot and Anonymous: 31
- **Viburnum lantana** *Source:* http://en.wikipedia.org/wiki/Viburnum_lantana?oldid=665219439 *Contributors:* MPF, Keith Edkins, Hesperian, Stemonitis, Eubot, Aiselu, Bruce Marlin, Dvc214, Shultz IV, Cydebot, Thijs!bot, MarkBuckles, JAnDbot, Bumper12, Colchicum, VolkovBot, Una Smith, Broadbot, Jaguarlaser, SieBot, DragonBot, Addbot, مانې, Cookie, Luckas-bot, Amirobot, ArthurBot, Xqbot, PigFlu Oink, FoxBot, EmausBot, EleferenBot, ZéroBot, Syrio, عمرو بن لئ‌ثوم, Braincricket, Vago, Vagobot, NotWith, Pear Blossom, Makecat-bot, Impuls666666 and Anonymous: 9
- **Ligustrum vulgare** *Source:* http://en.wikipedia.org/wiki/Ligustrum_vulgare?oldid=607292610 *Contributors:* Nonenmac, Imc, MPF, Hesperian, Stemonitis, Woohookitty, Eubot, West Virginian, Rkitko, MalafayaBot, MrDarwin, Easchiff, Bumper12, Jaguarlaser, Jvs, PipepBot, Alexbot, DumZiBoT, Addbot, SpBot, Yobot, ArthurBot, DrilBot, Elektryczne jabłko, Conservation ranger, Androstachys, EmausBot, ZéroBot, Omar hoftun, BG19bot, Declangi, Darorcilmir, ArmbrustBot, Joseph Laferriere and Anonymous: 7

75.5.2 Images

- **File:-_Ligustrum_vulgare_-_Berries_-.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/b/bf/-_Ligustrum_vulgare_-_Berries_-.jpg *License:* CC BY-SA 2.5 *Contributors:* Own work *Original artist:* User:Nino Barbieri
- **File:0_Prunus_avium_-_Havré_(1).JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/7/7a/0_Prunus_avium_-_Havr%C3%A9_%281%29.JPG *License:* CC BY 3.0 *Contributors:* Self-photographed *Original artist:* Jean-Pol GRANDMONT
- **File:15_year_old_lime-tree,_Haute-Savoie,_France.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/e/ee/15_year_old_lime-tree%2C_Haute-Savoie%2C_France.jpg *License:* GFDL *Contributors:* Own work *Original artist:* Yann Forget
- **File:2005plums_and_sloes.PNG** *Source:* http://upload.wikimedia.org/wikipedia/commons/0/00/2005plums_and_sloes.PNG *License:* CC BY-SA 3.0 *Contributors:* Transferred from en.wikipedia to Commons by Stefan4 using CommonsHelper. *Original artist:* Anwar saadat at English Wikipedia
- **File:2013-05-23_07_24_06_Crataegus_monogyna_'Crimson_Cloud'_blossoms_in_Elko_Nevada.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/2f/2013-05-23_07_24_06_Crataegus_monogyna_%27Crimson_Cloud%27_blossoms_in_Elko_Nevada.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Famartin
- **File:2014-08-29_13_46_38_Variegated_English_Holly_at_the_Pinelands_Preservation_Alliance_headquarters_in_Southampton_Township,_New_Jersey.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/e/e5/2014-08-29_13_46_38_Variegated_English_Holly_at_the_Pinelands_Preservation_Alliance_headquarters_in_Southampton_Township%2C_New_Jersey.JPG *License:* CC BY-SA 4.0 *Contributors:* Own work *Original artist:* Famartin

- **File:2014-10-30_09_58_18_European_Birch_foliage_during_autumn_along_Terrace_Boulevard_in_Ewing,_New_Jersey.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/e/e5/2014-10-30_09_58_18_European_Birch_foliage_during_autumn_along_Terrace_Boulevard_in_Ewing%2C_New_Jersey.JPG *License:* CC BY-SA 4.0 *Contributors:* Own work *Original artist:* Famartin
- **File:2014-11-02_15_43_09_English_Holly_along_Glen_Mawr_Drive_in_Ewing,_New_Jersey.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/e/e8/2014-11-02_15_43_09_English_Holly_along_Glen_Mawr_Drive_in_Ewing%2C_New_Jersey.JPG *License:* CC BY-SA 4.0 *Contributors:* Own work *Original artist:* Famartin
- **File:20140204Hainbuche_Neulussheim3.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/d/d9/20140204Hainbuche_Neulussheim3.jpg *License:* CC0 *Contributors:* Own work *Original artist:* AnRo0002
- **File:2015-02-28_Close-ups_of_Salicaceae_flowers,_Weinviertel_(Producer_M._Stich).jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/0/0b/2015-02-28_Close-ups_of_Salicaceae_flowers%2C_Weinviertel_%28Producer_M._Stich%29.jpg *License:* CC BY-SA 4.0 *Contributors:* Own work *Original artist:* Hubertl
- **File:237_Acer_campestre.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/f/f5/237_Acer_campestre.jpg *License:* Public domain *Contributors:* «Bilder ur Nordens Flora» Stockholm *Original artist:* Carl Axel Magnus Lindman
- **File:243_Hippophae_rhamnoides.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/4/4d/243_Hippophae_rhamnoides.jpg *License:* Public domain *Contributors:* «Bilder ur Nordens Flora» Stockholm *Original artist:* Carl Axel Magnus Lindman
- **File:3D_rendering_of_a_µCT_scan_of_a_maple_seed.ogv** *Source:* http://upload.wikimedia.org/wikipedia/commons/3/38/3D_rendering_of_a_%C2%B5CT_scan_of_a_maple_seed.ogv *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* SecretDisc
- **File:95apple.jpeg** *Source:* http://upload.wikimedia.org/wikipedia/commons/9/92/95apple.jpeg *License:* Public domain *Contributors:* http://www.ars.usda.gov/Aboutus/docs.htm?docid=6310 *Original artist:* *Agricultural Research Service* (Research agent of *United States Department of Agriculture*)
- **File:A_sectioned_alder_root_nodule_gall.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/8/82/A_sectioned_alder_root_nodule_gall.JPG *License:* Public domain *Contributors:* self-made - Roger Griffith *Original artist:* Rosser1954
- **File:Aardbei-bloemcloseup.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/9/9d/Aardbei-bloemcloseup.jpg *License:* CC-BY-SA-3.0 *Contributors:* zelfgemaakte foto *Original artist:* Rasbak
- **File:Acebo.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/8/87/Acebo.jpg *License:* CC-BY-SA-3.0 *Contributors:* ? *Original artist:* ?
- **File:Acer_campestre_005.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/6/66/Acer_campestre_005.jpg *License:* CC BY-SA 2.5 *Contributors:* Own work *Original artist:* Willow
- **File:Acer_campestre_Weinsberg_20070419_1.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/1/1a/Acer_campestre_Weinsberg_20070419_1.jpg *License:* CC-BY-SA-3.0 *Contributors:* Own work (own picture) *Original artist:* Rosenzweig
- **File:Acer_griseum3.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/8/89/Acer_griseum3.jpg *License:* CC BY 2.5 *Contributors:* ? *Original artist:* ?
- **File:Acer_palmatum_sango_kaku.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/8/89/Acer_palmatum_sango_kaku.jpg *License:* CC BY-SA 2.5 *Contributors:* ? *Original artist:* ?
- **File:Acer_saccharum.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/26/Acer_saccharum.jpg *License:* CC BY-SA 2.5 *Contributors:* Own work http://www.cirrusimage.com/tree_maple_sugar.htm *Original artist:* Bruce Marlin
- **File:Agrilus_planipennis_001.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/7/75/Agrilus_planipennis_001.jpg *License:* CC BY 3.0 *Contributors:* Forestry Images *Original artist:* Pennsylvania Department of Conservation and Natural Resources - Forestry Archive
- **File:AldenBiesen02.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/4/42/AldenBiesen02.jpg *License:* CC-BY-SA-3.0 *Contributors:* Own work *Original artist:* Sir Gawain
- **File:Alder_trees_by_the_Beaulieu_River_at_Longwater_Lawn.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/7/71/Alder_trees_by_the_Beaulieu_River_at_Longwater_Lawn.jpg *License:* CC BY-SA 2.0 *Contributors:* http://www.flickr.com/photos/treehouse1977/788432319/ *Original artist:* Jim Champion
- **File:Alkottar.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/0/04/Alkottar.jpg *License:* CC BY-SA 3.0 *Contributors:* ? *Original artist:* ?
- **File:Alnus-viridis-leaves.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/9/98/Alnus-viridis-leaves.JPG *License:* CC-BY-SA-3.0 *Contributors:* Own work *Original artist:* Sten Porse
- **File:Alnus_glutinosa.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/7/7b/Alnus_glutinosa.jpg *License:* CC BY 2.5 *Contributors:* ? *Original artist:* ?
- **File:Alnus_glutinosa_MHNT.BOT.2004.0.10a.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/28/Alnus_glutinosa_MHNT.BOT.2004.0.10a.jpg *License:* CC BY-SA 4.0 *Contributors:* Own work *Original artist:* Didier Descouens
- **File:Alnus_incana_rugosa_leaves.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/f/fb/Alnus_incana_rugosa_leaves.jpg *License:* CC-BY-SA-3.0 *Contributors:* inmygarden *Original artist:* Quadell
- **File:Alnus_serrulata_leaves.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/f/f7/Alnus_serrulata_leaves.jpg *License:* CC-BY-SA-3.0 *Contributors:* ? *Original artist:* ?
- **File:American_Cherries_in_supermarket.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/6/60/American_Cherries_in_supermarket.JPG *License:* CC BY-SA 4.0 *Contributors:* Own work *Original artist:* Maksym Kozlenko
- **File:An_alder_root_nodule_gall.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/9/94/An_alder_root_nodule_gall.JPG *License:* Public domain *Contributors:* self-made - Roger Griffith *Original artist:* Rosser1954
- **File:Ancient_lime_tree_-_geograph.org.uk_-_75721.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/b/b4/Ancient_lime_tree_-_geograph.org.uk_-_75721.jpg *License:* CC BY-SA 2.0 *Contributors:* From geograph.org.uk *Original artist:* Penny Mayes

- **File:Apfelbaum_Boskop_Hochstamm.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/6/6b/Apfelbaum_Boskop_Hochstamm.jpg *License:* CC BY-SA 2.0 de *Contributors:* shot by myself / eigene Aufnahme *Original artist:* Maseltov
- **File:Apple_stark_s.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/3/30/Apple_stark_s.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Roberta F.
- **File:Apple_tree_blossom.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/c/c3/Apple_tree_blossom.JPG *License:* Public domain *Contributors:* self-made - Roger Griffith *Original artist:* Rosser1954
- **File:Apple_tree_leaves_with_insect_damage.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/0/04/Apple_tree_leaves_with_insect_damage.jpg *License:* CC BY-SA 2.5 *Contributors:* OpenPhoto.net *Original artist:* Michael Jastremski
- **File:Apples.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/e/ee/Apples.jpg *License:* Public domain *Contributors:* This image was released by the Agricultural Research Service, the research agency of the United States Department of Agriculture, with the ID K7252-65 (next). *Original artist:* Scott Bauer, USDA
- **File:Arctic-Norway-aspen-Ofotf jord.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/5/57/Arctic-Norway-aspen-Ofotf jord.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Orcaborealis
- **File:Artocarpus_heterophyllus_fruits_at_tree.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/d/d0/Artocarpus_heterophyllus_fruits_at_tree.jpg *License:* CC-BY-SA-3.0 *Contributors:* Own work *Original artist:* Photo taken by User:Ahoerstemeier on June 28, 2003 in Chaiya, Surat Thani Province, Thailand.
- **File:Ash_flower.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/4/46/Ash_flower.JPG *License:* CC-BY-SA-3.0 *Contributors:* ? *Original artist:* ?
- **File:Ash_mast_at_Eglinton.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/0/0f/Ash_mast_at_Eglinton.JPG *License:* Public domain *Contributors:* Own work *Original artist:* Rosser1954 Roger Griffith
- **File:Aspen-leaves.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/6/6d/Aspen-leaves.jpg *License:* CC-BY-SA-3.0 *Contributors:* Transferred from en.wikipedia *Original artist:* Original uploader was MPF at en.wikipedia
- **File:Aubépine_épineuse._Crataegus_laevigata._Mahieddine_Boumendjel.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/1/14/Aub%C3%A9pine_%C3%A9pineuse._Crataegus_laevigata._Mahieddine_Boumendjel.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Mahieddine Boumendjel
- **File:Auricularia_auricula-judae_Eglinton.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/6/6e/Auricularia_auricula-judae_Eglinton.JPG *License:* Public domain *Contributors:* Own work *Original artist:* Rosser1954 Roger Griffith
- **File:Avenue_of_lime_trees_at_Turville_Heath_-_geograph.org.uk_-_39077.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/5/5e/Avenue_of_lime_trees_at_Turville_Heath_-_geograph.org.uk_-_39077.jpg *License:* CC BY-SA 2.0 *Contributors:* From geograph.org.uk *Original artist:* David Hawgood
- **File:Baginton_oak_tree_july06.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/5/5e/Baginton_oak_tree_july06.JPG *License:* CC-BY-SA-3.0 *Contributors:* Transferred from en.wikipedia *Original artist:* Original uploader was Snowmanradio at en.wikipedia
- **File:Beech_Aerial_Roots.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/e/e4/Beech_Aerial_Roots.JPG *License:* Public domain *Contributors:* Own work *Original artist:* Rosser1954 Roger Griffith
- **File:Beech_with_Branches.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/6/66/Beech_with_Branches.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Marqqq
- **File:Beechnuts_in_an_autumn.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/a/ac/Beechnuts_in_an_autumn.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Jin Zan
- **File:Betula_pendula_laciniata0.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/8/8d/Betula_pendula_laciniata0.jpg *License:* CC-BY-SA-3.0 *Contributors:* ? *Original artist:* ?
- **File:Betula_pendula_winter.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/5/5a/Betula_pendula_winter.jpg *License:* CC-BY-SA-3.0 *Contributors:* ? *Original artist:* ?
- **File:Betula_pubescens_and_Salix_cinerea_seeds.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/8/8d/Betula_pubescens_and_Salix_cinerea_seeds.JPG *License:* Public domain *Contributors:* Own work *Original artist:* Rosser1954 Roger Griffith
- **File:Big_bristlecone_pine_Pinus_longaeva.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/5/58/Big_bristlecone_pine_Pinus_longaeva.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Dcrjsr
- **File:Bing_Cherries_(USDA_ARS).jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/4/40/Bing_Cherries_%28USDA_ARS%29.jpg *License:* Public domain *Contributors:* This image was released by the Agricultural Research Service, the research agency of the United States Department of Agriculture, with the ID K11182-1 (next). *Original artist:* Peggy Greb, USDA ARS
- **File:Birch,_finished.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/28/Birch%2C_finished.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Bubba73
- **File:Birch,_unfinished.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/0/09/Birch%2C_unfinished.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Bubba73
- **File:Birch_bark_document_210.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/2a/Birch_bark_document_210.jpg *License:* Public domain *Contributors:* ? *Original artist:* ?
- **File:Birch_bark_front_rear.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/7/7d/Birch_bark_front_rear.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Choogler

- **File:Birke_Multiplex.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/8/81/Birke_Multiplex.JPG *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Lutzeputz
- **File:Black_Che.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/9/94/Black_Che.jpg *License:* CC BY-SA 4.0 *Contributors:* Own work *Original artist:* Diako1971
- **File:Bogenbau-Flaemischer-Spleiss.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/9/98/Bogenbau-Flaemischer-Spleiss.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Simon A. Eugster
- **File:Bonsai_Federahorn.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/f/f6/Bonsai_Federahorn.jpg *License:* CC-BY-SA-3.0 *Contributors:* Own work (own picture) *Original artist:* Armin Kübelbeck, www.best4sports.de
- **File:Bourgoyen_knotted_willow_and_woodpile.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/8/8a/Bourgoyen_knotted_willow_and_woodpile.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Demeester
- **File:Boxwood_Buxus_sempervirens_var._arborescens_Bark_2597px.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/a/a1/Boxwood_Buxus_sempervirens_var._arborescens_Bark_2597px.jpg *License:* GFDL 1.2 *Contributors:* Self-photographed *Original artist:* Photo (c)2007 Derek Ramsey (Ram-Man)
- **File:Boxwood_Buxus_sempervirens_var._arborescens_Bark_Closeup_1825px.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/9/92/Boxwood_Buxus_sempervirens_var._arborescens_Bark_Closeup_1825px.jpg *License:* GFDL 1.2 *Contributors:* Self-photographed *Original artist:* Photo (c)2007 Derek Ramsey (Ram-Man)
- **File:Brussels_Zonienwoud.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/c/c6/Brussels_Zonienwoud.jpg *License:* CC-BY-SA-3.0 *Contributors:* Own work *Original artist:* Donarreiskoffer
- **File:Buckthorn_cutting_board.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/d/d5/Buckthorn_cutting_board.JPG *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* MartinFields
- **File:Burr_on_Black_poplar.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/20/Burr_on_Black_poplar.JPG *License:* Public domain *Contributors:* self-made - Roger Griffith *Original artist:* Rosser1954
- **File:Buxus-microphylla-sinica.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/5/51/Buxus-microphylla-sinica.JPG *License:* CC-BY-SA-3.0 *Contributors:* Own work *Original artist:* Sten Porse
- **File:Buxus_henryi.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/b/b3/Buxus_henryi.jpg *License:* Public domain *Contributors:* Own work *Original artist:* PiPi
- **File:Buxus_sempervirens.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/f/fd/Buxus_sempervirens.jpg *License:* CC BY 2.5 *Contributors:* ? *Original artist:* ?
- **File:Buxus_sempervirens0.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/a/a0/Buxus_sempervirens0.jpg *License:* CC-BY-SA-3.0 *Contributors:* ? *Original artist:* ?
- **File:Buxus_wallichiana.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/9/92/Buxus_wallichiana.jpg *License:* CC-BY-SA-3.0 *Contributors:* Own work *Original artist:* MPF
- **File:Camperdown_Elm_Prospect_Park_Brooklyn.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/20/Camperdown_Elm_Prospect_Park_Brooklyn.jpg *License:* CC-BY-SA-3.0 *Contributors:* ? *Original artist:* ?
- **File:Canada_flag_halifax_9_-04.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/6/68/Canada_flag_halifax_9_-04.JPG *License:* CC-BY-SA-3.0 *Contributors:* Own work *Original artist:* Photograph taken by Jared Grove (Phobophile) with a Nicon Coolpix 3200.
- **File:Canker_on_Ash.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/1/18/Canker_on_Ash.JPG *License:* Public domain *Contributors:* self-made - Roger Griffith *Original artist:* Rosser1954
- **File:Carl_Larsson_Brita_as_Iduna.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/1/11/Carl_Larsson_Brita_as_Iduna.jpg *License:* Public domain *Contributors:* Weingarten Verlag website (a German calendar editing house) *Original artist:* Carl Larsson
- **File:Carpinus_fruit.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/e/e7/Carpinus_fruit.jpg *License:* CC-BY-SA-3.0 *Contributors:* ? *Original artist:* ?
- **File:Celastraceae_-_Euonymus_europaeus-1.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/0/0a/Celastraceae_-_Euonymus_europaeus-1.JPG *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Hectonichus
- **File:Charpente_eglise_Saint-Girons_Monein.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/b/be/Charpente_eglise_Saint-Girons_Monein.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Myrabella
- **File:CheckmateProper.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/c/c4/CheckmateProper.jpg *License:* CC-BY-SA-3.0 *Contributors:* Transferred from en.wikipedia to Commons. *Original artist:* Bubba73 at English Wikipedia
- **File:CherryYield.png** *Source:* http://upload.wikimedia.org/wikipedia/commons/8/81/CherryYield.png *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* AndrewMT
- **File:Cherry_Stella444.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/b/bb/Cherry_Stella444.jpg *License:* CC-BY-SA-3.0 *Contributors:* Own work *Original artist:* Benjamint444, edited by Fir0002
- **File:Cherry_trees_in_Tehran..jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/28/Cherry_trees_in_Tehran..jpg *License:* Attribution *Contributors:* Own work *Original artist:* Milad Mosapoor
- **File:Coat_of_arms_of_Estonia.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/2b/Coat_of_arms_of_Estonia.svg *License:* Public domain *Contributors:*
- http://www.riigikantselei.ee/?id=2501 *Original artist:* Riigikantselei
- **File:Common_hawthorn.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/c/c0/Common_hawthorn.jpg *License:* CC-BY-SA-3.0 *Contributors:* ? *Original artist:* ?
- **File:Common_hawthorn_flowers.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/c/cb/Common_hawthorn_flowers.jpg *License:* CC-BY-SA-3.0 *Contributors:* ? *Original artist:* ?

- **File:Commons-logo.svg** *Source:* http://upload.wikimedia.org/wikipedia/en/4/4a/Commons-logo.svg *License:* ? *Contributors:* ? *Original artist:* ?
- **File:Cork_oak_trunk_section.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/7/7f/Cork_oak_trunk_section.jpg *License:* Public domain *Contributors:* en:Image:Cork oak trunk section.jpg *Original artist:* Plantsurfer
- **File:Cornus-sanguinea.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/d/d5/Cornus-sanguinea.JPG *License:* CC-BY-SA-3.0 *Contributors:* Own work *Original artist:* Sten Porse
- **File:Crab_apples_by_the_roadside_-_geograph.org.uk_-_978786.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/0/01/Crab_apples_by_the_roadside_-_geograph.org.uk_-_978786.jpg *License:* CC BY-SA 2.0 *Contributors:* From geograph.org.uk *Original artist:* Jonathan Billinger
- **File:Curly_maple_bench.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/9/99/Curly_maple_bench.jpg *License:* CC BY 2.5 *Contributors:* Transferred from en.wikipedia to Commons. *Original artist:* Xyzzycoder at English Wikipedia
- **File:Cytisus_scoparius2.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/e/e0/Cytisus_scoparius2.jpg *License:* CC-BY-SA-3.0 *Contributors:* ? *Original artist:* ?
- **File:Detail_of_Biscogniauxia_nummularia.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/1/15/Detail_of_Biscogniauxia_nummularia.JPG *License:* Public domain *Contributors:* Own work *Original artist:* Rosser1954 Roger Griffith
- **File:DosenmoorBirken1.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/1/1b/DosenmoorBirken1.jpg *License:* CC BY-SA 2.0 de *Contributors:* Original: de.wikipedia.org *12:20, 2008-06-29 . . 3.872×2.592 (6 MB) . . Wilde Natur Original artist:* Wilde Natur
- **File:Dryad_(PSF).png** *Source:* http://upload.wikimedia.org/wikipedia/commons/1/1f/Dryad_%28PSF%29.png *License:* Public domain *Contributors:* Archives of Pearson Scott Foresman, donated to the Wikimedia Foundation *Original artist:* Pearson Scott Foresman
- **File:Durer_Adam_and_Eve.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/e/ea/Durer_Adam_and_Eve.jpg *License:* Public domain *Contributors:* abcgallery.com *Original artist:* Albrecht Dürer
- **File:Dutch_Elm_Disease_strikes_Badingham_-_geograph.org.uk_-_1288154.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/5/5e/Dutch_Elm_Disease_strikes_Badingham_-_geograph.org.uk_-_1288154.jpg *License:* CC BY-SA 2.0 *Contributors:* From geograph.org.uk *Original artist:* Bruce Mitchell
- **File:Edit-clear.svg** *Source:* http://upload.wikimedia.org/wikipedia/en/f/f2/Edit-clear.svg *License:* Public domain *Contributors:* The *Tango! Desktop Project*. *Original artist:*

  The people from the Tango! project. And according to the meta-data in the file, specifically: "Andreas Nilsson, and Jakub Steiner (although minimally)."
- **File:Eglinton_fish_pond_island_inosculated_Q._petraea.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/c/c6/Eglinton_fish_pond_island_inosculated_Q._petraea.JPG *License:* Public domain *Contributors:* Own work *Original artist:* Rosser1954 Roger Griffith
- **File:Eiche_bei_Schönderling,_2.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/0/02/Eiche_bei_Sch%C3%B6nderling%2C_2.jpg *License:* CC0 *Contributors:* Own work *Original artist:* Rainer Lippert
- **File:El_Hierro_Sabinar.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/9/91/El_Hierro_Sabinar.JPG *License:* CC BY 2.5 *Contributors:* Own work *Original artist:* Eckhard Pecher
- **File:Elder_growing_on_Sycamore,_Dalry,_Scotland.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/6/60/Elder_growing_on_Sycamore%2C_Dalry%2C_Scotland.JPG *License:* Public domain *Contributors:* Own work *Original artist:* Rosser1954 Roger Griffith
- **File:Elderberry-jam.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/b/b5/Elderberry-jam.JPG *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Kou07kou
- **File:English_Elm_avenue.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/f/f6/English_Elm_avenue.jpg *License:* CC BY 2.5 *Contributors:* Own work *Original artist:* Melburnian
- **File:English_Yew_600.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/d/d6/English_Yew_600.jpg *License:* CC-BY-SA-3.0 *Contributors:* Transferred from en.wikipedia to Commons by Sfan00_IMG using CommonsHelper. *Original artist:* The original uploader was Sannse at English Wikipedia
- **File:English_Yew_close_250.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/3/35/English_Yew_close_250.jpg *License:* CC-BY-SA-3.0 *Contributors:* Transferred from en.wikipedia to Commons. *Original artist:* Sannse at English Wikipedia
- **File:Eriophyes_tiliae_tiliae.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/b/bc/Eriophyes_tiliae_tiliae.JPG *License:* Public domain *Contributors:* Own work *Original artist:* Rosser1954 Roger Griffith
- **File:Esche_gemeine_Holz.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/6/66/Esche_gemeine_Holz.JPG *License:* CC-BY-SA-3.0 *Contributors:* ? *Original artist:* ?
- **File:European_Beech.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/d/d0/European_Beech.jpg *License:* CC-BY-SA-3.0 *Contributors:* Transferred from en.wikipedia to Commons. *Original artist:* photo en:User:MPF
- **File:Fagus_engleriana_-_Morris_Arboretum_-_DSC00475.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/7/7f/Fagus_engleriana_-_Morris_Arboretum_-_DSC00475.JPG *License:* CC0 *Contributors:* Own work *Original artist:* Daderot
- **File:Fagus_sylvatica_MHNT.BOT.2004.0.312.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/b/b0/Fagus_sylvatica_MHNT.BOT.2004.0.312.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Roger Culos
- **File:Fagus_sylvatica_MHNT.BOT.2010.6.81.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/d/d8/Fagus_sylvatica_MHNT.BOT.2010.6.81.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Jean-Pierre Chéreau & Roger Culos
- **File:Fagus_sylvatica_Purpurea_JPG4a.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/b/ba/Fagus_sylvatica_Purpurea_JPG4a.jpg *License:* CC BY 3.0 *Contributors:* Self-photographed *Original artist:* Jean-Pol GRANDMONT
- **File:Fagus_sylvatica_pliocenica_MHNT.PAL.VEG.2002.31.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/e/e8/Fagus_sylvatica_pliocenica_MHNT.PAL.VEG.2002.31.jpg *License:* CC BY-SA 4.0 *Contributors:* Own work *Original artist:* Didier Descouens

- **File:Flag_of_Albania.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/3/36/Flag_of_Albania.svg *License:* Public domain *Contributors:* ? *Original artist:* ?
- **File:Flag_of_Armenia.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/2f/Flag_of_Armenia.svg *License:* Public domain *Contributors:* Own work *Original artist:* SKopp
- **File:Flag_of_Austria.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/4/41/Flag_of_Austria.svg *License:* Public domain *Contributors:* Own work, http://www.bmlv.gv.at/abzeichen/dekorationen.shtml *Original artist:* User:SKopp
- **File:Flag_of_Azerbaijan.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/d/dd/Flag_of_Azerbaijan.svg *License:* Public domain *Contributors:* http://www.elibrary.az/docs/remz/pdf/remz_bayraq.pdf and http://www.meclis.gov.az/?/az/topcontent/21 *Original artist:* SKopp and others
- **File:Flag_of_Belarus.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/8/85/Flag_of_Belarus.svg *License:* Public domain *Contributors:* http://www.tnpa.by/ViewFileText.php?UrlRid=52178&UrlOnd=%D1%D2%C1%20911-2008 *Original artist:* Zscout370
- **File:Flag_of_Bosnia_and_Herzegovina.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/b/bf/Flag_of_Bosnia_and_Herzegovina.svg *License:* Public domain *Contributors:* Own work *Original artist:* Kseferovic
- **File:Flag_of_Bulgaria.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/9/9a/Flag_of_Bulgaria.svg *License:* Public domain *Contributors:* The flag of Bulgaria. The colors are specified at http://www.government.bg/cgi-bin/e-cms/vis/vis.pl?s=001&p=0034&n=000005&g= as: *Original artist:* SKopp
- **File:Flag_of_Chile.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/7/78/Flag_of_Chile.svg *License:* Public domain *Contributors:* Own work *Original artist:* SKopp
- **File:Flag_of_Croatia.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/1/1b/Flag_of_Croatia.svg *License:* Public domain *Contributors:* http://www.sabor.hr/Default.aspx?sec=4317 *Original artist:* Nightstallion, Elephantus, Neoneo13, Denelson83, Rainman, R-41, Minestrone, Lupo, Zscout370, **Ma****Ga** (based on Decision of the Parliament)
- **File:Flag_of_Denmark.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/9/9c/Flag_of_Denmark.svg *License:* Public domain *Contributors:* Own work *Original artist:* User:Madden
- **File:Flag_of_France.svg** *Source:* http://upload.wikimedia.org/wikipedia/en/c/c3/Flag_of_France.svg *License:* PD *Contributors:* ? *Original artist:* ?
- **File:Flag_of_Germany.svg** *Source:* http://upload.wikimedia.org/wikipedia/en/b/ba/Flag_of_Germany.svg *License:* PD *Contributors:* ? *Original artist:* ?
- **File:Flag_of_Greece.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/5/5c/Flag_of_Greece.svg *License:* Public domain *Contributors:* own code *Original artist:* (of code) cs:User:-xfi- (talk)
- **File:Flag_of_Hungary.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/c/c1/Flag_of_Hungary.svg *License:* Public domain *Contributors:*
- Flags of the World – Hungary *Original artist:* SKopp
- **File:Flag_of_India.svg** *Source:* http://upload.wikimedia.org/wikipedia/en/4/41/Flag_of_India.svg *License:* Public domain *Contributors:* ? *Original artist:* ?
- **File:Flag_of_Iran.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/c/ca/Flag_of_Iran.svg *License:* Public domain *Contributors:* URL http://www.isiri.org/portal/files/std/1.htm and an English translation / interpretation at URL http://flagspot.net/flags/ir'.html *Original artist:* Various
- **File:Flag_of_Italy.svg** *Source:* http://upload.wikimedia.org/wikipedia/en/0/03/Flag_of_Italy.svg *License:* PD *Contributors:* ? *Original artist:* ?
- **File:Flag_of_Lebanon.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/5/59/Flag_of_Lebanon.svg *License:* Public domain *Contributors:* ? *Original artist:* Traced based on the CIA World Factbook with some modification done to the colours based on information at Vexilla mundi.
- **File:Flag_of_Macedonia.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/f/f8/Flag_of_Macedonia.svg *License:* Public domain *Contributors:* Own work *Original artist:* User:SKopp, rewritten by User:Gabbe
- **File:Flag_of_Moldova.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/27/Flag_of_Moldova.svg *License:* Public domain *Contributors:* vector coat of arms image traced by User:Nameneko from Image:Moldova gerb large.png. Construction sheet can be found at http://flagspot.net/flags/md.html#const *Original artist:* Nameneko and others
- **File:Flag_of_Poland.svg** *Source:* http://upload.wikimedia.org/wikipedia/en/1/12/Flag_of_Poland.svg *License:* Public domain *Contributors:* ? *Original artist:* ?
- **File:Flag_of_Romania.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/7/73/Flag_of_Romania.svg *License:* Public domain *Contributors:* Own work *Original artist:* AdiJapan
- **File:Flag_of_Russia.svg** *Source:* http://upload.wikimedia.org/wikipedia/en/f/f3/Flag_of_Russia.svg *License:* PD *Contributors:* ? *Original artist:* ?
- **File:Flag_of_Serbia.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/f/ff/Flag_of_Serbia.svg *License:* Public domain *Contributors:* From http://www.parlament.gov.rs/content/cir/o_skupstini/simboli/simboli.asp. *Original artist:* sodipodi.com
- **File:Flag_of_Spain.svg** *Source:* http://upload.wikimedia.org/wikipedia/en/9/9a/Flag_of_Spain.svg *License:* PD *Contributors:* ? *Original artist:* ?

- **File:Flag_of_Syria.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/5/53/Flag_of_Syria.svg *License:* Public domain *Contributors:* see below *Original artist:* see below
- **File:Flag_of_Turkey.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/b/b4/Flag_of_Turkey.svg *License:* Public domain *Contributors:* Turkish Flag Law (Türk Bayrağı Kanunu), Law nr. 2893 of 22 September 1983. Text (in Turkish) at the website of the Turkish Historical Society (Türk Tarih Kurumu) *Original artist:* David Benbennick (original author)
- **File:Flag_of_Ukraine.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/4/49/Flag_of_Ukraine.svg *License:* Public domain *Contributors:* ДСТУ 4512:2006 - Державний прапор України. Загальні технічні умови

  SVG: 2010

  Original artist: України
- **File:Flag_of_Uzbekistan.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/8/84/Flag_of_Uzbekistan.svg *License:* Public domain *Contributors:* Own work *Original artist:* O'zbekiston Respublikasining Davlat bayrog'i. The officially defined colours are Pantone 313C for blue and 361C for green (source: [1], [2]). Drawn by User:Zscout370.
- **File:Flag_of_the_People'{}s_Republic_of_China.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/f/fa/Flag_of_the_People%27s_Republic_of_China.svg *License:* Public domain *Contributors:* Own work, http://www.protocol.gov.hk/flags/eng/n_flag/design.html *Original artist:* Drawn by User:SKopp, redrawn by User:Denelson83 and User:Zscout370
- **File:Flag_of_the_United_States.svg** *Source:* http://upload.wikimedia.org/wikipedia/en/a/a4/Flag_of_the_United_States.svg *License:* PD *Contributors:* ? *Original artist:* ?
- **File:Flowers_Black_Elder.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/8/8c/Flowers_Black_Elder.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Cppgx
- **File:Folder_Hexagonal_Icon.svg** *Source:* http://upload.wikimedia.org/wikipedia/en/4/48/Folder_Hexagonal_Icon.svg *License:* Cc-by-sa-3.0 *Contributors:* ? *Original artist:* ?
- **File:Four_Poplars_in_four_seasons.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/8/86/Four_Poplars_in_four_seasons.JPG *License:* Public domain *Contributors:* Own work, see other versions *Original artist:* Cherubino
- **File:Frangula-alnus-asplenifolia-autumn.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/0/0b/Frangula-alnus-asplenifolia-autumn.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Sten Porse
- **File:Frangula-alnus-buds-2010-02-11.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/0/01/Frangula-alnus-buds-2010-02-11.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Sten Porse
- **File:Fraxinus_excelsior_4560.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/1/1b/Fraxinus_excelsior_4560.jpg *License:* CC-BY-SA-3.0 *Contributors:* Own work *Original artist:* Pleple2000
- **File:Gardens,_Princes_Street,_Edinburgh_-_DSC06170.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/8/80/Gardens%2C_Princes_Street%2C_Edinburgh_-_DSC06170.JPG *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Rept0n1x
- **File:Glandes_Prunus_avium.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/5/53/Glandes_Prunus_avium.jpg *License:* CC BY-SA 2.5 *Contributors:* Own work *Original artist:* André Abrahami
- **File:Grafting_of_Plum_(cultivar_Regina_Claudia_yellow).JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/3/32/Grafting_of_Plum_%28cultivar_Regina_Claudia_yellow%29.JPG *License:* CC0 *Contributors:* Own work *Original artist:* Galloramenu
- **File:Greengages.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/20/Greengages.jpg *License:* Public domain *Contributors:* ? *Original artist:* ?
- **File:Grib_skov.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/5/5b/Grib_skov.jpg *License:* CC-BY-SA-3.0 *Contributors:* Own work *Original artist:* Malene Thyssen
- **File:Hankasalmi_stream.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/9/9b/Hankasalmi_stream.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Tiia Monto
- **File:Haselnuss_Gr_99.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/5/5e/Haselnuss_Gr_99.jpg *License:* CC-BY-SA-3.0 *Contributors:* Own work *Original artist:* Horst Frank
- **File:Hazel_Catkins_aka.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/e/eb/Hazel_Catkins_aka.jpg *License:* CC BY-SA 2.5 *Contributors:* Own work *Original artist:* André Karwath aka Aka
- **File:Hazelnut_in_blossom.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/c/c3/Hazelnut_in_blossom.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Schnobby
- **File:Hercules_Musei_Capitolini_MC1265_n2.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/4/4d/Hercules_Musei_Capitolini_MC1265_n2.jpg *License:* CC BY-SA 3.0 *Contributors:* User:Tetraktys (2006) *Original artist:* ?
- **File:Hippophae_rhamnoides_female_flowers.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/c/c8/Hippophae_rhamnoides_female_flowers.jpg *License:* CC0 *Contributors:* Own work *Original artist:* Proton02
- **File:Hippophae_rhamnoides_male_flowers.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/0/03/Hippophae_rhamnoides_male_flowers.jpg *License:* CC0 *Contributors:* Own work *Original artist:* Proton02
- **File:Holly_Christmas_card_from_NLI.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/d/d6/Holly_Christmas_card_from_NLI.jpg *License:* Public domain *Contributors:* NLI, http://www.flickr.com/photos/yournlireland/6504149265/sizes/o/in/photostream/ *Original artist:* Shirley Wynne
- **File:Hollyflowers.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/c/ce/Hollyflowers.jpg *License:* CC-BY-SA-3.0 *Contributors:* ? *Original artist:* ?
- **File:Holz_der_Stieleiche.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/3/3e/Holz_der_Stieleiche.jpg *License:* CC-BY-SA-3.0 *Contributors:* Fotografiert am 28. Oktober 2004 *Original artist:* Lotron
- **File:Huangshan.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/1/19/Huangshan.jpg *License:* CC-BY-SA-3.0 *Contributors:* ? *Original artist:* ?

- **File:Husband_and_wife_trees_-_Blackthorn.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/8/86/Husband_and_wife_trees_-_Blackthorn.JPG *License:* Public domain *Contributors:* Own work *Original artist:* Rosser1954 Roger Griffith
- **File:Hyde_park_tree.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/f/f3/Hyde_park_tree.jpg *License:* CC BY-SA 2.5 *Contributors:* Wikipedia *Original artist:* Eoppy user of English Wikipedia
- **File:Hyphodontia_sambuci_Eglinton.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/5/54/Hyphodontia_sambuci_Eglinton.JPG *License:* Public domain *Contributors:* Own work *Original artist:* Rosser1954 Roger Griffith
- **File:If_Estry.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/9/9f/If_Estry.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Roi.dagobert
- **File:If_cincentenaire_49.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/6/65/If_cincentenaire_49.JPG *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Lamiot
- **File:Ilex-aquifolium_(Europaeische_Stechpalme-1).jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/9/96/Ilex-aquifolium_%28Europaeische_Stechpalme-1%29.jpg *License:* CC BY-SA 2.0 de *Contributors:* Own work (selbst erstelltes Foto) *Original artist:* Jürgen Howaldt
- **File:Illustration_Betula_pendula0.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/7/78/Illustration_Betula_pendula0.jpg *License:* Public domain *Contributors:* ? *Original artist:* ?
- **File:Illustration_Pinus_sylvestris0_new.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/c/c3/Illustration_Pinus_sylvestris0_new.jpg *License:* Public domain *Contributors:*
- Illustration_Pinus_sylvestris0.jpg *Original artist:* floranet|]]
- **File:Illustration_Prunus_spinosa1.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/8/8d/Illustration_Prunus_spinosa1.jpg *License:* Public domain *Contributors:* ? *Original artist:* ?
- **File:Italienische_Süßkirschen.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/c/c7/Italienische_S%C3%BC%C3%9Fkirschen.JPG *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* 4028mdk09
- **File:Jakobframe.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/28/Jakobframe.jpg *License:* Public domain *Contributors:* en:Image:Jakobframe.jpg *Original artist:* en:user:Svennex
- **File:John_Constable_006.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/e/e5/John_Constable_006.jpg *License:* Public domain *Contributors:* The Yorck Project: *10.000 Meisterwerke der Malerei.* DVD-ROM, 2002. ISBN 3936122202. Distributed by DIRECTMEDIA Publishing GmbH. *Original artist:* John Constable
- **File:John_Deere_2054_DHSP_forestry_swing_machine,_Kaibab_National_Forest_1.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/20/John_Deere_2054_DHSP_forestry_swing_machine%2C_Kaibab_National_Forest_1.jpg *License:* CC BY-SA 2.0 *Contributors:* originally posted to **Flickr** as Horse Pine Stewardship Contract *Original artist:* Kaibab National Forest
- **File:Juhász_Gyula_memorial_tree.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/6/60/Juh%C3%A1sz_Gyula_memorial_tree.JPG *License:* CC BY 3.0 *Contributors:* Own work *Original artist:* Burrows
- **File:Jun_chin_close.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/6/65/Jun_chin_close.jpg *License:* CC BY-SA 3.0 *Contributors:* Transferred from en.wikipedia to Commons. *Original artist:* The original uploader was MPF at English Wikipedia
- **File:Jun_com_cones.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/4/4c/Juniperus_communis_cones.jpg *License:* CC BY 2.5 *Contributors:* Own work *Original artist:* MPF
- **File:JuniperEssentialOil.png** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/2e/JuniperEssentialOil.png *License:* Public domain *Contributors:* Own work *Original artist:* Itineranttrader
- **File:JuniperRockCreek.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/8/82/JuniperRockCreek.JPG *License:* Public domain *Contributors:* Own work *Original artist:* Wilson44691
- **File:Juniper_berries_q.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/e/eb/Juniper_berries_q.jpg *License:* CC-BY-SA-3.0 *Contributors:* Transferred from en.wikipedia to Commons. *Original artist:* Quadell at English Wikipedia
- **File:Juniper_needles.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/0/03/Juniper_needles.jpg *License:* CC BY-SA 3.0 *Contributors:* Transferred from en.wikipedia to Commons. *Original artist:* MPF at English Wikipedia
- **File:Juniper_wood_pieces_and_1_cent_coin.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/29/Juniper_wood_pieces_and_1_cent_coin.jpg *License:* CC0 *Contributors:* Own work *Original artist:* Anonimski
- **File:Juniperseeds.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/4/41/Juniperseeds.jpg *License:* Public domain *Contributors:* Own work *Original artist:* Hardyplants at English Wikipedia
- **File:JuniperusCommunisAlpina.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/d/d6/JuniperusCommunisAlpina.jpg *License:* CC BY 2.5 *Contributors:* Own work *Original artist:* Neva Micheva
- **File:KDJHPOP.JPG** *Source:* http://upload.wikimedia.org/wikipedia/en/5/5f/KDJHPOP.JPG *License:* CC-BY-SA-3.0 *Contributors:* ? *Original artist:* ?
- **File:Kirschblueten-2011-ffm-075.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/c/cc/Kirschblueten-2011-ffm-075.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Dontworry
- **File:Koeh-108.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/c/c9/Malus_domestica_-_K%C3%B6hler%E2%80%93s_Medizinal-Pflanzen-108.jpg *License:* Public domain *Contributors:* List of Koehler Images *Original artist:* Franz Eugen Köhler, *Köhler's Medizinal-Pflanzen*
- **File:KoreanPineSeeds.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/b/b7/KoreanPineSeeds.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* MPF
- **File:LaHayeDeRoutotIf1.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/0/03/LaHayeDeRoutotIf1.JPG *License:* CC BY 3.0 *Contributors:* Own work *Original artist:* Gérard Janot

- **File:Lafayette_Street,_Salem,_MA.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/f/fd/Lafayette_Street%2C_Salem%2C_MA.jpg *License:* Public domain *Contributors:* Reproduced from an original postcard published by the Hugh C. Leighton Company, Portland, Maine *Original artist:* Unknown photographer
- **File:Lesser_Coat_of_Arms_of_Ukraine.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/9/95/Lesser_Coat_of_Arms_of_Ukraine.svg *License:* Public domain *Contributors:*
- Drawn to specifications from http://search.ligazakon.ua/l_doc2.nsf/link1/T213700.html *Original artist:*
- Alex Khristov
- **File:Linde_bei_Frankenbrunn.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/0/01/Linde_bei_Frankenbrunn.jpg *License:* Public domain *Contributors:* Own work *Original artist:* Rainer Lippert
- **File:Loode_tammik_ülastega_kevadel.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/6/60/Loode_tammik_%C3%BClastega_kevadel.jpg *License:* CC BY-SA 4.0 *Contributors:* Own work *Original artist:* Margus6
- **File:MIN_Rungis_pommes.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/3/3a/MIN_Rungis_pommes.jpg *License:* CC BY-SA 4.0 *Contributors:* Own work *Original artist:* Myrabella
- **File:Maple7951.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/9/92/Maple7951.JPG *License:* CC-BY-SA-3.0 *Contributors:* ? *Original artist:* ?
- **File:Maple_between_pines.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/0/0d/Maple_between_pines.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Remilo
- **File:March_dyke_sourlie.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/6/6d/March_dyke_sourlie.JPG *License:* Public domain *Contributors:* Own work *Original artist:* Rosser1954 Roger Griffith
- **File:Max_Slevogt_Achill.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/b/b8/Max_Slevogt_Achill.jpg *License:* Public domain *Contributors:* http://www.villa-grisebach.de/ *Original artist:* Max Slevogt
- **File:Medlar_rootstock.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/a/a2/Medlar_rootstock.jpg *License:* Public domain *Contributors:* uploaded from PC *Original artist:* totnesmartin
- **File:Meenikunno_maastikukaiteala.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/5/5b/Meenikunno_maastikukaiteala.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Ruta Badina
- **File:Mirabellen.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/1/14/Mirabellen.jpg *License:* CC-BY-SA-3.0 *Contributors:* ? *Original artist:* ?
- **File:Molen_De_Hoop,_Oldebroek_spoorwiel.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/e/e9/Molen_De_Hoop%2C_Oldebroek_spoorwiel.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Rasbak
- **File:Mountain-birch-Trollheimen.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/1/13/Mountain-birch-Trollheimen.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Orcaborealis
- **File:NarrowleafAsh.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/1/16/NarrowleafAsh.jpg *License:* CC-BY-SA-3.0 *Contributors:* Own work *Original artist:* MPF
- **File:Oak_Mildew.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/4/40/Oak_Mildew.JPG *License:* Public domain *Contributors:* Own work *Original artist:* Rosser1954 Roger Griffith
- **File:Oaksprout.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/e/ef/Oaksprout.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Max Ronnersjö
- **File:Olmo.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/26/Olmo.jpg *License:* CC BY-SA 3.0 *Contributors:* http://www.antiquariatoerestauro.com *Original artist:* Gixie
- **File:Orchmason.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/4/47/Orchmason.jpg *License:* CC BY 3.0 *Contributors:* Own work *Original artist:* Red58bill
- **File:Pair_of_lemons.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/5/56/Pair_of_lemons.jpg *License:* GFDL 1.2 *Contributors:* Own work *Original artist:*
  fir0002 | flagstaffotos.com.au
- **File:Pamirihouse.JPG** *Source:* http://upload.wikimedia.org/wikipedia/en/b/b6/Pamirihouse.JPG *License:* PD *Contributors:*
  I created this work entirely by myself.
  Original artist:
  Iftikhor Vatanshoev
- **File:People_icon.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/3/37/People_icon.svg *License:* CC0 *Contributors:* OpenClipart *Original artist:* OpenClipart
- **File:Pine_forest_in_Sweden.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/4/42/Pine_forest_in_Sweden.jpg *License:* CC BY-SA 2.0 *Contributors:* http://www.flickr.com/photos/tetrapak/5956902891/sizes/m/in/set-72157628342553177/ *Original artist:* AB Tetra Pak
- **File:Pink_lady_and_cross_section.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/a/a6/Pink_lady_and_cross_section.jpg *License:* GFDL 1.2 *Contributors:* Own work *Original artist:*
  fir0002 | flagstaffotos.com.au
- **File:Pinus_kesiya_Binga.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/c/ca/Pinus_kesiya_Binga.jpg *License:* CC BY 2.0 *Contributors:* Flickr *Original artist:* anne_jimenez on Flickr
- **File:Pinus_sylvestris_MHNT.BOT.2005.0.971.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/8/80/Pinus_sylvestris_MHNT.BOT.2005.0.971.jpg *License:* CC BY-SA 4.0 *Contributors:* Own work *Original artist:* Didier Descouens

- **File:Pinus_sylvestris_Sturm01.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/5/56/Pinus_sylvestris_Sturm01.jpg *License:* Public domain *Contributors:* Figure 1 from *Deutschlands Flora in Abbildungen* at http://www.biolib.de *Original artist:* Johann Georg Sturm (Painter: Jacob Sturm)
- **File:Pinus_sylvestris_cones_pl.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/d/d1/Pinus_sylvestris_cones_pl.jpg *License:* GFDL *Contributors:* Own work *Original artist:* Pleple2000
- **File:Pinus_sylvestris_hamata_Babugan.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/b/bc/Pinus_sylvestris_hamata_Babugan.jpg *License:* CC BY-SA 2.0 *Contributors:* Flickr *Original artist:* ancientsword at Flickr
- **File:Pinus_sylvestris_prepared_for_transport,_Hungary.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/7/77/Pinus_sylvestris_prepared_for_transport%2C_Hungary.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Inhaizer
- **File:Pinus_syvestris_seedling.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/a/ad/Pinus_syvestris_seedling.jpg *License:* CC BY 2.5 *Contributors:* http://lietuvai.lt/wiki/Vaizdas:MazaPusis.jpg *Original artist:* Audrius Meškauskas (photgrapher)
- **File:Plants_in_Donetsk_120.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/a/ad/Plants_in_Donetsk_120.JPG *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* This picture has been taken by Andrew Butko. Contact e-mail: abutko@gmail.com. Do not copy this image illegally by ignoring the terms of the CC-BY-SA or GNU FDL licenses, as it is not in the public domain. Other photos see here.
- **File:Plum_blossom_on_the_first_day_of_spring_-_geograph.org.uk_-_1214413.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/25/Plum_blossom_on_the_first_day_of_spring_-_geograph.org.uk_-_1214413.jpg *License:* CC BY-SA 2.0 *Contributors:* From geograph.org.uk *Original artist:* Jonathan Billinger
- **File:Plum_tree.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/e/e8/Plum_tree.jpg *License:* GFDL 1.2 *Contributors:* Own work *Original artist:*
  fir0002 | flagstaffotos.com.au
- **File:Plums_early_morning.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/7/7c/Plums_early_morning.jpg *License:* GFDL 1.2 *Contributors:* Own work *Original artist:*
  fir0002 | flagstaffotos.com.au
- **File:Poplar_seed_tufts_2009_G1.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/a/aa/Poplar_seed_tufts_2009_G1.jpg *License:* Public domain *Contributors:* Own work *Original artist:* George Chernilevsky
- **File:Poplars_of_Khorog_City_Park.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/5/54/Poplars_of_Khorog_City_Park.JPG *License:* Public domain *Contributors:* Own work by the original uploader *Original artist:* Iftikhor (talk)
- **File:Populier_mannelijke_bloeiwijze_(Populus_canadensis_male_inflorescens).jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/0/0a/Populier_mannelijke_bloeiwijze_%28Populus_canadensis_male_inflorescens%29.jpg *License:* CC-BY-SA-3.0 *Contributors:* Own work *Original artist:* Rasbak
- **File:PopulusNigra3.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/d/d6/PopulusNigra3.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work. ***Location:*** North-eastern Lower Saxony, Germany. *Original artist:* Christian Fischer
- **File:Populus_lasiocarpa_leaves_01_by_Line1.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/a/a0/Populus_lasiocarpa_leaves_01_by_Line1.JPG *License:* CC BY-SA 3.0 *Contributors:* Picture taken with my IXUS 800 IS *Original artist:* Liné1
- **File:Populus_nigra-bekes.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/5/54/Populus_nigra-bekes.jpg *License:* Public domain *Contributors:* Own work *Original artist:* László Szalai (Beyond silence)
- **File:Prescribed_burn_in_a_Pinus_nigra_stand_in_Portugal.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/0/03/Prescribed_burn_in_a_Pinus_nigra_stand_in_Portugal.JPG *License:* Public domain *Contributors:* Transferred from en.wikipedia *Original artist:* Pfern at en.wikipedia (Paulo Fernandes)
- **File:Prestvannet-parkvei.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/f/fb/Prestvannet-parkvei.jpg *License:* Public domain *Contributors:* ? *Original artist:* ?
- **File:Prunus_domestica_'Reine_Victoria'.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/1/16/Prunus_domestica_%27Reine_Victoria%27.jpg *License:* CC-BY-SA-3.0 *Contributors:* Own work *Original artist:* Rasbak
- **File:Prunus_padus_Tuomi_marjoja_VII_04_2989_C.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/b/b8/Prunus_padus_Tuomi_marjoja_VII_04_2989_C.JPG *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Anneli Salo
- **File:Q-robur-concordia.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/2f/Q-robur-concordia.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Zkrzaków
- **File:QuercusRobur_ZasiegGatunku01.png** *Source:* http://upload.wikimedia.org/wikipedia/commons/b/b6/QuercusRobur_ZasiegGatunku01.png *License:* CC-BY-SA-3.0 *Contributors:* Originally from pl.wikipedia; description page is (was) here *Original artist:* User Borch3kawki on pl.wikipedia
- **File:Quercus_petraea_02.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/d/d1/Quercus_petraea_02.jpg *License:* CC BY-SA 2.5 *Contributors:* ? *Original artist:* ?
- **File:Quercus_robur_-_sprouting_acorn.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/1/19/Quercus_robur_-_sprouting_acorn.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Amphis
- **File:Quercus_robur_MHNT.BOT.2010.6.75.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/e/e4/Quercus_robur_MHNT.BOT.2010.6.75.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Jean-Pierre Chéreau & Roger Culos
- **File:Quercus_stellata.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/1/10/Quercus_stellata.jpg *License:* CC BY 2.5 *Contributors:* ? *Original artist:* ?
- **File:Question_book-new.svg** *Source:* http://upload.wikimedia.org/wikipedia/en/9/99/Question_book-new.svg *License:* Cc-by-sa-3.0 *Contributors:*
  Created from scratch in Adobe Illustrator. Based on Image:Question book.png created by User:Equazcion *Original artist:*
  Tkgd2007

- **File:RN_Ulmus_minor_Umbraculifera.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/5/5d/RN_Ulmus_minor_Umbraculifera.JPG *License:* CC0 *Contributors:* Nijboer Collection *Original artist:* Ronnie Nijboer
- **File:Red_and_Green_apples_in_India.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/5/58/Red_and_Green_apples_in_India.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Aravind Sivaraj
- **File:Rhamnus_cathartica_(8023754928).jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/0/08/Rhamnus_cathartica_%288023754928%29.jpg *License:* CC BY-SA 2.0 *Contributors:* Rhamnus cathartica *Original artist:* Matt Lavin from Bozeman, Montana, USA
- **File:Rhamnus_frangula_07_ies.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/9/9d/Rhamnus_frangula_07_ies.jpg *License:* CC-BY-SA-3.0 *Contributors:* Own work *Original artist:* Frank Vincentz
- **File:RhytismaAcerinumDetailU.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/a/a4/RhytismaAcerinumDetailU.jpg *License:* CC-BY-SA-3.0 *Contributors:* ? *Original artist:* ?
- **File:Riemenschneider_Hl_Georg.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/3/3a/Riemenschneider_Hl_Georg.jpg *License:* Public domain *Contributors:* Own work (own photograph). *Original artist:* Tilman Riemenschneider
- **File:Rindenmulch016.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/5/58/Rindenmulch016.JPG *License:* GPL *Contributors:* Own work *Original artist:* Apostoloff
- **File:Rock_Whitebeam-leaf_lower.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/a/a6/Rock_Whitebeam-leaf_lower.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Robert Matthews
- **File:Rock_Whitebeam-leaf_upper_1.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/f/f7/Rock_Whitebeam-leaf_upper_1.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Robert Matthews
- **File:Rock_Whitebeam-leaf_upper_2.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/f/fa/Rock_Whitebeam-leaf_upper_2.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Robert Matthews
- **File:Rock_Whitebeam-twig.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/3/3d/Rock_Whitebeam-twig.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Robert Matthews
- **File:Rock_Whitebeam-young_plant.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/c/cc/Rock_Whitebeam-young_plant.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Robert Matthews
- **File:Rose_Amber_Flush_20070601.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/3/37/Rose_Amber_Flush_20070601.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Georges Seguin (Okki)
- **File:Rotor_poplar_and_willow_cuttings_planter,_planting_a_new_nursery_of_poplar_for_biomass_with_short_rotation..JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/b/bf/Rotor_poplar_and_willow_cuttings_planter%2C_planting_a_new_nursery_of_poplar_for_biomass_with_short_rotation..JPG *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Mattia480ac
- **File:Rowan_flowers-oliv.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/21/Rowan_flowers-oliv.jpg *License:* CC BY 2.5 *Contributors:* ? *Original artist:* ?
- **File:Rowan_tree_20081002b.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/26/Rowan_tree_20081002b.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Eeno11
- **File:Salis_shield_Altes_Gebau_Coire.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/b/b3/Salis_shield_Altes_Gebau_Coire.jpg *License:* CC-BY-SA-3.0 *Contributors:* Own work *Original artist:* Fotografie: Rodolph 13:57, 5. Jan. 2009 (CET)
- **File:Salix-catkins.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/1/19/Salix-catkins.JPG *License:* CC-BY-SA-3.0 *Contributors:* ? *Original artist:* ?
- **File:Salix-purpurea-leaves.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/9/9c/Salix-purpurea-leaves.JPG *License:* CC-BY-SA-3.0 *Contributors:* ? *Original artist:* ?
- **File:Salix_alba_020.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/21/Salix_alba_020.jpg *License:* CC BY 2.5 *Contributors:* Own work *Original artist:* Willow
- **File:Salix_aurita_Sturm26.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/1/17/Salix_aurita_Sturm26.jpg *License:* Public domain *Contributors:* Fig. from book *Deutschlands Flora in Abbildungen* at http://www.biolib.de *Original artist:* Johann Georg Sturm (Painter: Jacob Sturm)
- **File:Salix_caprea_02.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/1/19/Salix_caprea_02.jpg *License:* Public domain *Contributors:* Own work *Original artist:* Bernie
- **File:Salix_cinerea_flowers-2.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/1/17/Salix_cinerea_flowers-2.jpg *License:* CC-BY-SA-3.0 *Contributors:* Own work *Original artist:* BCB
- **File:Salix_fragilis_002.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/f/f1/Salix_fragilis_002.jpg *License:* CC BY 2.5 *Contributors:* Own work *Original artist:* Willow
- **File:Salix_pentandra(02).jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/e/e7/Salix_pentandra%2802%29.jpg *License:* Public domain *Contributors:* ? *Original artist:* ?
- **File:Salix_silesiaca_a5.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/1/1d/Salix_silesiaca_a5.jpg *License:* CC BY 2.5 *Contributors:* Own work *Original artist:* Opioła Jerzy
- **File:Salix_triandra_bark.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/3/32/Salix_triandra_bark.JPG *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Bernd Sauerwein
- **File:Sambuci_flos_dried.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/9/93/Sambuci_flos_dried.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Rillke
- **File:Sambucus_nigra2.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/e/e1/Sambucus_nigra2.jpg *License:* CC-BY-SA-3.0 *Contributors:* ? *Original artist:* ?

- **File:Sambucus_nigra_canadensis_&_cerulea_range_map_2.png** *Source:* http://upload.wikimedia.org/wikipedia/commons/6/62/Sambucus_nigra_canadensis_%26_cerulea_range_map_2.png *License:* Public domain *Contributors:* <a data-x-rel='nofollow' class='external text' href='http://esp.cr.usgs.gov/data/little/'>USGS Geosciences and Environmental Change Science Center: Digital Representations of Tree Species Range Maps from: Elbert L. Little, Jr. (1976), *Atlas of United States trees,* ***Vol. 3****, minor Western hardwoods*: U.S. Department of Agriculture Miscellaneous Publication 1314, 13 p., 290 maps and Elbert L. Little, Jr. (1977), *Atlas of United States trees,* ***Vol. 4****, minor Eastern hardwoods*: U.S. Department of Agriculture Miscellaneous Publication 1342, 17 p., 230 maps. *Original artist:* Elbert L. Little, Jr., of the U.S. Department of Agriculture, Forest Service
- **File:Sandworm_by_Marco_Casagrande_@_Wenduine,_Belgium.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/7/73/Sandworm_by_Marco_Casagrande_%40_Wenduine%2C_Belgium.jpg *License:* CC0 *Contributors:* Own work *Original artist:* Härmägeddon
- **File:Sawfly_larvae_on_silver_birch_140701_(Tony_Holkham).JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/c/c0/Sawfly_larvae_on_silver_birch_140701_%28Tony_Holkham%29.JPG *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Tony Holkham
- **File:Schlehe1.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/29/Schlehe1.jpg *License:* CC BY-SA 2.5 *Contributors:* ? *Original artist:* ?
- **File:Scots_Pines_Beinn_a'_Bhuird.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/4/46/Scots_Pines_Beinn_a%27_Bhuird.jpg *License:* CC BY 2.0 *Contributors:* Beinn a' Bhuird *Original artist:* Graham Lewis
- **File:Sheringham_Park_1.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/7/78/Sheringham_Park_1.JPG *License:* CC-BY-SA-3.0 *Contributors:* Photograph by myself with original filename DCP_3921.JPG. Unmodified. *Original artist:* Chris Wood (User: chris_j_wood).
- **File:Sherry_cellar,_Solera_system,_2003.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/c/ca/Sherry_cellar%2C_Solera_system%2C_2003.jpg *License:* CC-BY-SA-3.0 *Contributors:* Transfered from de.wikipedia.org *Original artist:* Falkue
- **File:Slivka.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/a/a9/Slivka.JPG *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Maciarka
- **File:Sorbus-aucuparia.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/0/02/Sorbus-aucuparia.JPG *License:* Public domain *Contributors:* Own work *Original artist:* **Giallopolenta**
- **File:Sorbus_aucuparia_fruit_comparison.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/8/85/Sorbus_aucuparia_fruit_comparison.jpg *License:* CC BY-SA 4.0 *Contributors:* Own work *Original artist:* Hekerui
- **File:Sorbus_aucuparia_inflorescence_kz.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/3/3e/Sorbus_aucuparia_inflorescence_kz.jpg *License:* GFDL *Contributors:* Own work *Original artist:* Kenraiz
- **File:Sorbus_domestica.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/3/3f/Sorbus_domestica.JPG *License:* CC-BY-SA-3.0 *Contributors:* Etna, Sicily *Original artist:* archenzo
- **File:Sorbus_glabrescens1.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/8/86/Sorbus_glabrescens1.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* MPF
- **File:Sorbus_torminalis_Weinsberg_20070929_5.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/e/e3/Sorbus_torminalis_Weinsberg_20070929_5.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work (own picture) *Original artist:* Rosenzweig
- **File:Stand_of_birch_trees.jpg** *Source:* http://upload.wikimedia.org/wikipedia/en/c/cf/Stand_of_birch_trees.jpg *License:* CC-BY-3.0 *Contributors:* ? *Original artist:* ?
- **File:Strom1.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/23/Strom1.jpg *License:* CC-BY-SA-3.0 *Contributors:* ? *Original artist:* ?
- **File:Sügise_märgid.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/5/59/S%C3%BCgise_m%C3%A4rgid.jpg *License:* CC BY-SA 4.0 *Contributors:* Own work *Original artist:* Aleksander Kaasik
- **File:Tamme-Lauri_Tamm_suvel.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/a/a2/Tamme-Lauri_Tamm_suvel.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Abrget47j
- **File:Taphrina_pruni,_Pocket_Plum_gall.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/5/51/Taphrina_pruni%2C_Pocket_Plum_gall.JPG *License:* Public domain *Contributors:* Own work *Original artist:* Rosser1954 Roger Griffith
- **File:Taxus_baccata_MHNT.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/3/31/Taxus_baccata_MHNT.jpg *License:* CC BY-SA 4.0 *Contributors:* Own work *Original artist:* Didier Descouens
- **File:Taxus_baccata_MHNT_seed.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/d/d6/Taxus_baccata_MHNT_seed.jpg *License:* CC BY-SA 4.0 *Contributors:* Own work *Original artist:* Didier Descouens
- **File:The_Llangernyw_yew.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/0/03/The_Llangernyw_yew.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Emgaol
- **File:Tilia_cordata_MHNT.BOT.2004.0.780.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/e/eb/Tilia_cordata_MHNT.BOT.2004.0.780.jpg *License:* CC BY-SA 4.0 *Contributors:* Own work *Original artist:* Didier Descouens
- **File:Tilia_johnsoni_01.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/1/17/Tilia_johnsoni_01.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Kevmin
- **File:Tilia_x_europea-2.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/8/85/Tilia_x_europea-2.JPG *License:* CC-BY-SA-3.0 *Contributors:* Own work *Original artist:* Alvesgaspar
- **File:Tiliae_flos_dried.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/0/02/Tiliae_flos_dried.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Rillke
- **File:Tilleul,_Haute-Savoie,_France.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/8/8c/Tilleul%2C_Haute-Savoie%2C_France.jpg *License:* GFDL *Contributors:* Own work *Original artist:* Yann Forget
- **File:Tree_template.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/9/98/Tree_template.svg *License:* CC BY-SA 3.0 *Contributors:*

- File:Tango icon nature.svg
- File:Blank_template.svg

Original artist:

- DarKobra
- Urutseg
- Ain92

- **File:Ulmus_Parvifolia.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/3/32/Ulmus_Parvifolia.JPG *License:* Public domain *Contributors:* Own work *Original artist:* 1000Faces
- **File:Viburnum_opulus.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/6/6f/Viburnum_opulus.jpg *License:* CC BY-SA 3.0 *Contributors:* Transferred from en.wikipedia to Commons. *Original artist:* Original uploader was Wouter Hagens at en.wikipedia
- **File:Viburnum_opulus_Sterilis.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/4/4a/Viburnum_opulus_Sterilis.JPG *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Diako1971
- **File:View_across_field_from_Bradwell_Road,_Tillingham_-_geograph.org.uk_-_275831.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/23/View_across_field_from_Bradwell_Road%2C_Tillingham_-_geograph.org.uk_-_275831.jpg *License:* CC BY-SA 2.0 *Contributors:* From geograph.org.uk *Original artist:* David Kemp
- **File:Vine_Maple_leaves_and_flowers.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/8/88/Vine_Maple_leaves_and_flowers.jpg *License:* CC-BY-SA-3.0 *Contributors:* Own work *Original artist:* Tony Perodeau
- **File:Waldkiefer_(junge_männliche_Zapfen)_-_sosna_zwyczajna_(kwiatostan_męski)_-_Pinus_sylvestris.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/5/59/Waldkiefer_%28junge_m%C3%A4nnliche_Zapfen%29_-_sosna_zwyczajna_%28kwiatostan_m%C4%99ski%29_-_Pinus_sylvestris.jpg *License:* GFDL *Contributors:* Own work *Original artist:* Aorg1961
- **File:Wappen_at_grossarl.png** *Source:* http://upload.wikimedia.org/wikipedia/commons/1/16/Wappen_at_grossarl.png *License:* Public domain *Contributors:* ? *Original artist:* ?
- **File:WhiteBeamBranch.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/25/WhiteBeamBranch.JPG *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Gaffer206
- **File:White_Elm_rooted_cutting.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/d/d4/White_Elm_rooted_cutting.jpg *License:* Public domain *Contributors:* A H Brookes private collection. *Original artist:* Ptelea at English Wikipedia
- **File:Whitewillowtincture.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/d/da/Whitewillowtincture.jpg *License:* CC BY 3.0 *Contributors:* Own work *Original artist:* Badagnani
- **File:Wiki_letter_w_cropped.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/1/1c/Wiki_letter_w_cropped.svg *License:* CC-BY-SA-3.0 *Contributors:*
- Wiki_letter_w.svg *Original artist:* Wiki_letter_w.svg: Jarkko Piiroinen
- **File:Wikibooks-logo.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/f/fa/Wikibooks-logo.svg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* User:Bastique, User:Ramac et al.
- **File:Wikinews-logo.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/2/24/Wikinews-logo.svg *License:* CC BY-SA 3.0 *Contributors:* This is a cropped version of Image:Wikinews-logo-en.png. *Original artist:* Vectorized by Simon 01:05, 2 August 2006 (UTC) Updated by Time3000 17 April 2007 to use official Wikinews colours and appear correctly on dark backgrounds. Originally uploaded by Simon.
- **File:Wikiquote-logo.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/f/fa/Wikiquote-logo.svg *License:* Public domain *Contributors:* ? *Original artist:* ?
- **File:Wikisource-logo.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/4/4c/Wikisource-logo.svg *License:* CC BY-SA 3.0 *Contributors:* Rei-artur *Original artist:* Nicholas Moreau
- **File:Wikispecies-logo.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/d/df/Wikispecies-logo.svg *License:* CC BY-SA 3.0 *Contributors:* Image:Wikispecies-logo.jpg *Original artist:* (of code) cs:User:-xfi-
- **File:Wikiversity-logo-Snorky.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/1/1b/Wikiversity-logo-en.svg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Snorky
- **File:Wiktionary-logo-en.svg** *Source:* http://upload.wikimedia.org/wikipedia/commons/f/f8/Wiktionary-logo-en.svg *License:* Public domain *Contributors:* Vector version of Image:Wiktionary-logo-en.png. *Original artist:* Vectorized by Fvasconcellos (talk · contribs), based on original logo tossed together by Brion Vibber
- **File:Willow_species_with_Honeysuckle_woodbine.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/d/dc/Willow_species_with_Honeysuckle_woodbine.JPG *License:* Public domain *Contributors:* Own work *Original artist:* Rosser1954 Roger Griffith
- **File:Willow_whistle.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/3/36/Willow_whistle.jpg *License:* CC-BY-SA-3.0 *Contributors:* Own work *Original artist:* Photo taken by Muu-karhu
- **File:Wistman'{}s_Wood_in_winter.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/9/9c/Wistman%27s_Wood_in_winter.jpg *License:* CC BY-SA 2.0 *Contributors:* ancient woodland *Original artist:* alex jane from london, uk
- **File:WldschdVogelb.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/d/dd/WldschdVogelb.JPG *License:* CC-BY-SA-3.0 *Contributors:* Transferred from de.wikipedia to Commons by Crux using CommonsHelper. *Original artist:* Hajotthu
- **File:Young-catkin.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/e/e5/Young-catkin.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work http://www.ref6.com/archive/2011/04/16/male-catkin/ *Original artist:* Marcel Zurreck
- **File:Липа_взимку.jpg** *Source:* http://upload.wikimedia.org/wikipedia/commons/c/c9/%D0%9B%D0%B8%D0%BF%D0%B0_%D0%B2%D0%B7%D0%B8%D0%BC%D0%BA%D1%83.jpg *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Ejensyd
- **File:Ліщина_взимку,_2.JPG** *Source:* http://upload.wikimedia.org/wikipedia/commons/0/09/%D0%9B%D1%96%D1%89%D0%B8%D0%BD%D0%B0_%D0%B2%D0%B7%D0%B8%D0%BC%D0%BA%D1%83%2C_2.JPG *License:* CC BY-SA 3.0 *Contributors:* Own work *Original artist:* Ejensyd

75.5.3 Content license

- Creative Commons Attribution-Share Alike 3.0